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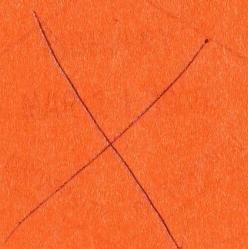
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RESEARCH PROGRAM on the
TRAINING OF SKILLED MANPOWER

TECHNOLOGICAL CHANGES
IN THE
RAILWAY INDUSTRY
MARITIME AREA OF CNR



ORT No. 12
OCTOBER 1964

DEPARTMENT OF LABOUR

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October 1964

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FOREWORD

This report is one of a series of studies carried out under the Skilled Manpower Training Research Program initiated by the Federal Department of Labour in 1956, in co-operation with other interested federal and provincial departments and management and union organizations. The research program is under the general direction of the Interdepartmental Skilled Manpower Training Research Committee, and its aims and objectives are set out in detail in Report No. 1 of this series entitled "Progress Report", issued in June 1957.

One important phase of the Skilled Manpower Training Research Program has been the study of technological changes in selected industries and their effects on manpower and training requirements. In this work the Committee has been greatly assisted by the tripartite Advisory Committee on Technological Change, which was set up in 1957. Another main research theme has been the study of technical and vocational training programs. Additional studies that have been carried out under this program include a report on the ways in which a selected group acquired their skills, and other reports on the introduction of electronic data processing in offices. A list of the reports available in this series will be found on the inside of the front cover.

This publication, which deals with Canadian National Railways' operations in the Atlantic region, is the first of several reports to be issued on the subject of the manpower effects of technological change in the railway industry in Canada. A second report, to be published at a later date, consists of an intensive study of technological change in a large railway shop. The industrial relations aspect of technological change is also being studied, with particular emphasis on the process of worker adjustment, and this will be the subject of a third report on the railway industry.

The planning of the project, field work, analysis and report writing were carried out by Mr. P.R. Schweitzer, formerly employed with the Economic's and Research Branch, under the supervision of Mr. P. Cohen and the direction of Mr. J.P. Francis. Several people assisted in various phases of the project, notably: Mr. W.E. Walker of the CNR, in the planning, field work and preliminary analysis; Mr. P. Hellen in project planning and Mr. Tom Torrance in the analysis of the data. Subsequent co-ordination of the final draft was carried out by Mr. A.H. Portigal, in consultation with the author.

The generous co-operation of the CNR and various unions was very much in evidence throughout the project and, while the list of individuals who assisted and provided valuable information would be impossible to enumerate here, special thanks are expressed, collectively, to officials in the CNR regional office in Moncton, and, individually, to Messrs. G. Lach, A.J. Bates, W. Peacock, and E.L. Murray at the CNR headquarters in Montreal. Editorial assistance in the preparation of this publication was provided by Mr. R.A. Knowles. Charts and general design layout were supervised by Mr. H. Dodds.

J.P. Francis,
Director,
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Introduction

This study which was conducted in 1961 is concerned with the manpower effects of technological change in the Maritime area of the Canadian National Railways. In this context and for the purposes of this report, the Maritime area consists of the three Atlantic provinces of Nova Scotia, New Brunswick, Prince Edward Island, and a small number of subdivisions in Eastern Quebec.^{1/} Newfoundland has been excluded from the study for the following reasons: the utilization of narrow-gauge railroads in the province, as distinct from the standard gauge railroads in use elsewhere; a large number of personnel connected with floating equipment; and the difficulties which would have been encountered in comparing operations in Newfoundland with those in the rest of the Atlantic provinces.

The analysis is confined, wherever possible, to railroad operations proper^{2/} which, in our definition, include express and road transport, but exclude hotel and communications activities of railroad concerns.

The attempts to trace the effects of technological changes in the railroad industry present an additional problem. Technological changes may result in shifts in the make-or-buy policy within the railroad industry. Thus an analysis of the railroad industry may prove to be inadequate if it fails to include secondary impacts on the railroad supply industries. Again, if we include the road transport operations of the railways in our analysis, trucking in both its competitive and complementary roles should be minutely analyzed.

It has not proven feasible to undertake a detailed study of these secondary effects. Brief discussion of them, where appropriate, will be carried out in general terms. It is by no means certain that these complex interactions could be traced and evaluated in a satisfactory manner, even if the necessary time and resources were available.

These and other decisions which restrict the scope of this study must certainly appear somewhat arbitrary. For instance, there is the possibility of distortion due to the exclusion of the operation of other railroads in the Maritime area. It was felt, however, that this omission would not seriously invalidate the findings, because the Canadian National provides most of the railroad transportation services in the area.

There is a serious question as to the degree to which our limited study is representative of the entire railroad industry in Canada. It is difficult to make a judgment on this matter. Although there are many similarities, a number of important differences do exist. It was necessary to make a small beginning somewhere, and the fact that Canadian National has, generally speaking, introduced most of its programs of technological change into the Maritime area first, made this

^{1/} Most of the study is based on data concerning what the CNR calls the 'Atlantic Region', a term that does not exactly correspond to the CNR organizational unit of the Maritime area. Hence the above definition for the purposes of this report.

^{2/} While, in the over-all data, floating-equipment personnel are usually included, no detailed analyses are made of technological changes in wharf operations and ferry services or of their manpower effects.

area a logical first choice. It does not appear to have been a conscious company policy to make the Maritime area the advance bastion of technological change; nevertheless, this appears to be what did happen during the post-war period.

Wherever these changes proved successful they were extended in a westward direction over the whole system. Our inquiry has, therefore, been focussed on an area in which the impact of technological change has occurred sooner than in other parts of the system.

A very attractive feature of the CNR Atlantic area, for purposes of this study, is the fact that it is the smallest administrative unit in the CNR. Consequently, it could be effectively handled within the scope of the available research resources. Moreover, research was facilitated by the fact that the CNR Atlantic area also maintains, on an experimental basis, certain employment records which were thought to be very valuable for this type of study. Information of this kind does not exist in the other regions of the CNR or in the CPR. Furthermore, the CNR recently revised their administrative unit boundaries and, while this area did not escape completely, the changes were very minor, and did not present any sort of barrier for this study. The choice of this area meant that the problem of adjusting historical data was reduced to a minimum, enhancing the reliability of the various time series available for the study.

At the same time, limitations on representativeness must be borne in mind. The characteristics of CNR operations in the Maritimes, as in any other region, differ from railway operations in other parts of the country. Special considerations of physical geography, population density and distribution, and the pattern of economic activity, all affect both the volume of transportation services demanded, and the nature of these services. For example, the Maritime area is far less industrialized than Southern Ontario. At the same time, the area is not so sparsely populated as the Prairie region. The fact that it is situated on the eastern seaboard, ensures that, at certain times of the year, a large volume of long-haul traffic will originate and terminate in this area. Its relatively high population density generates a strong demand for short-haul traffic. In consequence, it is evident that a more balanced demand exists for both long-haul and short-haul traffic in the Maritime area than in some other regions of Canada. In order to correct as far as possible for this bias, the scope of the study has been extended at a few points to include brief comparisons between the Maritime area and the Canadian National system as a whole.

The study is mainly concerned with changing manpower requirements in the railway industry. Its purpose is to analyze those factors which determine such requirements and, in particular, the factor of changing technology.

The study deals primarily with the decade 1950 to 1960. As a rule, we have included 1948 and 1949 because these were the years that marked the beginnings of diesel locomotive operation and, therefore, provide an excellent bench-mark for comparison with 1960, by which time the dieselization program of the CNR was completed. There is little doubt that the dieselization program has been the most significant and pervasive technological change in the railways during the post-war period.

Most of the information used in this inquiry was derived from company records. In addition to this primary source, we have relied on various government publications and other published material. The quality of the source data was generally excellent. In some areas of

information, however, data were unavailable or incomplete. In some cases the data had to be adjusted to produce homogeneous time series. Detailed explanations of the procedures used for this purpose will be given at appropriate places in the study. As the study was conducted in 1961 time references in terms of 'now' and 'recent', for example, should be associated with that year.

Chapter 1

The Maritimes and the Transportation Industry

The economic situation of the Maritimes and the changing role of railways in supplying transportation services is an important part of the background - perhaps, even more significant than its technology - and essential for an understanding of the changes in aggregate employment and its components that have taken place in the CNR Maritime area. Accordingly, this chapter will deal with the changing economic framework, and the next chapter will be devoted to the question of the precise nature of those technological changes which have taken place during the period under consideration.

During the past decade the Atlantic provinces have been involved in every national economic trend, but to a different degree from that of the economy as a whole, and generally to their disadvantage. For example, Gross Provincial Product has increased less than Gross National Product, and the trend towards more secondary manufacturing has been slower in the Maritimes than in Canada as a whole. As a result, unemployment rates in the Maritimes have been consistently higher than the national average. There is considerable general awareness of this situation, which has come to be recognized as a special problem of the Canadian economy.

Information developed by Mr. A.C. Parks,^{1/} Director of Research of the Atlantic Provinces Economic Council, indicates that, while the rate of economic advance in terms of Gross Product was slower in the Maritimes than in Canada as a whole, the relationship between per capita Gross Provincial, and Gross National Product did not change significantly over the period. This is simply to say that population growth as well as economic growth was slower in the Maritimes than in Canada as a whole.

The only exception to this generalization was in the case of New Brunswick, where, in 1948 to 1950, Gross Provincial Product per capita was approximately 56 per cent of Gross National Product per capita, a figure that dropped to approximately 53.2 per cent by 1958. The per capita measure takes into account the effects of the dynamics of population growth and migration.

Generally speaking, the increase in population of those aged 14 years and over was significantly lower in the Maritimes than in Canada as a whole,^{2/} a fact which helps to explain the growing differentials between Canada and the Maritime area in terms of volume of economic production.

Personal income per capita in the Maritime provinces as a percentage of personal income per capita in Canada presents, on the whole, a very similar picture. In 1948 it was 69.1 per cent in the three

^{1/} Details can be found in A.C. Parks, The Economy of the Atlantic Provinces, 1940-1958, published by the Atlantic Provinces Economic Council, Halifax, N.S.; Fredericton, N.B., June 1960. Gross Provincial Product, pages 1-13; other manufacturing, pages 74-93; personal income per capita, page 139; earned income, page 141.

^{2/} DBS, The Labour Force, Reference Paper 58, pages 114-115.

Maritime provinces, in 1950 it was 70.8 per cent, and in 1958 it had declined to 69.4 per cent. An even less favourable picture emerges if we look at earned income - that is, personal income less government transfer payments.

For the three Maritime provinces, earned income per capita as per cent of earned income per capita in Canada as a whole, rose from 66.4 per cent in 1948 to 68.4 per cent in 1950, after which it fell to 66.0 per cent in 1958. It should be added that in both comparisons Nova Scotia has gained over time while, in the same period, Prince Edward Island remained fairly stable. The relative deterioration of the overall situation in the Maritime provinces has been caused by a marked decrease in New Brunswick of personal income per capita as compared to personal income per capita in Canada, and earned income per capita, as related to earned income per capita in Canada.

The growth of secondary manufacturing, while more rapid than in Quebec and the Prairie provinces during the period 1949 to 1957, proceeded at a considerably lower rate than that of Ontario or British Columbia. Other factors, such as the relatively slow rate of migration, the widespread existence of subsistence farming in New Brunswick and Nova Scotia, the opening of the St. Lawrence Seaway, and the general decline of the coal mining industry, contributed substantially to the higher average unemployment rate in the Maritime provinces. All these factors clearly indicate that the Maritime provinces constitute a relatively depressed area.

These factors help to explain why there has been a much smaller rate of increase in the demand for total transportation services in the Maritimes, during the period under consideration, than there has been in the country as a whole. In addition, it should be noted that two developments - the opening of the St. Lawrence Seaway and the decline of the coal mining industry - have had a particularly decisive impact on the demand for long-haul transportation services.

The problems of economic development in the Maritimes have been thoroughly covered in a number of recent studies.^{3/} The broad trends that have been pointed out should be sufficient to characterize the economy that forms the background against which changes in CNR employment have taken place.

In Canada during the post-war period there has been substantial growth in the total demand for transportation services; at the same time the railway industry has been faced with sharp competition in this expanding market. The Dominion Bureau of Statistics estimates that, within the period 1948 to 1958, inter-city ton miles have increased roughly by 50 per cent, while the share of the railways in this market fell during the same period from approximately 68 per cent to approximately 51 per cent. The principal gains were enjoyed by road transportation and oil pipelines; the former rising from 6.2 per cent of the market in 1948 to 11.1 per cent in 1958, while pipelines rose from a near zero position to 13.4 per cent of all inter-city ton miles carried

^{3/} Among the more recent are: A.C. Parks, op. cit. Economic Development and the Atlantic Provinces by A.K. Cairncross, Atlantic Provinces Research Board 1961. Secondary Manufacturing in the Atlantic Provinces by F.E. Lownsbury, APEC 1961. Population Movements in the Atlantic Provinces by Kari Levitt, APEC 1960. This chapter draws fairly heavily on the research by Parks.

in 1958. Inter-city passenger miles, which in themselves amount to a relatively small share of passenger transportation, rose by approximately 128 per cent between 1948 and 1958. In spite of this spectacular passenger transportation increase, rail- and bus-revenue passenger miles declined about 29 per cent and 46 per cent respectively during the same period. The large gains were, of course, in the airlines and the increased use of private automobiles.

This pattern of competition between the various forms of transport is an outcome of changing technology. Improvements in automotive design and performance as well as the construction of a high-grade road system, have recently reached the point where it has become economical to transport goods by road rather than by rail for distances longer than the extremely short haul. This development has resulted in increased competition from road transport, and has set in motion a sequence of technological changes within the railway industry designed to improve its efficiency and competitive position. These developments within the railway industry constitute the starting point of this inquiry.

Comparable data on the transportation market of the Maritime provinces are not available, but some general comparisons are possible. First of all, it should be noted that there are no oil pipelines in the Maritime area. Furthermore, the tonnage carried by airlines in this area is negligible. Thus, only three forms of transportation need to be taken into account. These are railway, road, and water transport. The data that are available indicate that the increase in demand for rail-road transportation has been greater in the Maritimes than in the rest of Canada.

This is confirmed by the experience of the Canadian National Railways in terms of all output measures. The main reason for the CNR's comparatively better performance in the Maritimes is that road transport, while considerably increasing its share of ton miles carried in the Maritime area, did not increase its share of traffic in the Maritimes to the same degree as it did in other parts of the country. Also, the CNR introduced into this area a rather extensive trucking operation integrated with its rail operations. A second reason is, as already mentioned, the absence of pipelines. Furthermore, water transport, which (on a nation-wide scale) was able to increase its inter-city ton miles carried in the same proportion as the increase in all types of transportation services, failed to accomplish this in the Maritime area.

The fact that, by the late 1950's, the railway industry was able to obtain a slightly larger share of the entire market for transport in the Maritimes than in Canada generally, may be attributed in some measure to a relative lag in the development of modern high-grade highways in the Maritime area. A further contributing factor may be that the CNR in practice tended to introduce technological changes in the Maritime region first, with the result that their services there may have become competitive sooner than in the rest of Canada. This latter point is well illustrated in the comparative productivity figures (analyzed in Chapter 3), which show that the Maritime region is a relatively high productivity area within the Canadian National Railways system. A related factor is that the railway succeeded in substituting trucking services for train services earlier and far more extensively in the Maritimes than in the rest of the country, and has thereby retained a larger proportion of the transportation market for itself.

In summary, it was found that the most important factors in the economic background, against which the changes in the level and composition of employment of the CNR Maritime area will have to be evaluated, are:

- 1) the relatively slower expansion of demand for transportation services in general;
- 2) the relative absence of competing forms of transport;
- 3) an early and extensive program of utilizing new techniques in this region.

A description of these new techniques is provided in the next chapter.

Chapter 2

Specific Clusters of Technological Changes and their Employment Effects

In its most logical and most general sense, technological change means the application of new ideas to the process of producing goods and services. In fact, it is a familiar phenomenon in our society which, in the past century, has a remarkable record in the conversion of ideas into new products, new or improved production methods, and greater productivity.

Broadly speaking, two problems must be examined before reaching a satisfactory definition.

- 1) What is the phenomenon to be classified?
- 2) How shall the classification be made?

With respect to the first problem it has already been stated that technological change means the application of new ideas to the production process. The next problem, however, is to determine what is a new production process or when a material to be utilized is a new material.

At one extreme, some theorists suggest a narrow definition that would exclude most, if not all, the actual changes in technology taking place in industry. According to this view only the first successful adaptation of an idea to the production process qualifies as technological change.^{1/} Such an extreme view would rob the notion of all significance for economics or for the study of labour markets.

At the other extreme, it is possible to view all changes in production techniques as technological change. As an example, if a small machine shop buys a machine from a large company, a machine that is being sold because it is already obsolete but which replaces an even more obsolete machine in the small firm, this would be classed as technological change. Another extreme example may be posited in which an inefficient firm calls on the services of management consultants who streamline its organization and they do so according to accepted practice; this change again would be classified as technological change.

It will be quite evident at this stage that what is to be considered technological change will depend on the relative breadth or narrowness of the analytic framework. In empirical analysis, therefore, it would be rather futile to seek a single all-embracing definition. Instead, it would seem reasonable to define the analytic framework and, hence, provide a specific definition of the term technological change, according to the analytic ends in view.

The analytic framework in this particular study is defined as the railway industry in Canada. Even within this framework some allowance has to be made for the necessary lapse of time for changes in technology to become established and diffused throughout the industry. Accordingly, not only the first application of the new technique but its

^{1/} See exchange of views between V. Ruttan and P. Schweitzer in the Quarterly Journal of Economics, Feb. 1961, pages 152-156.

subsequent diffusion within a reasonable time period after the first experimental application would be classified as technological change. This would accomplish the primary aim of the study - the inclusion of the majority of actual changes in production techniques occurring in the industry - while retaining some criterion of novelty which is, in fact, an essential element in the concept of technological change.

The relative 'narrowness' of the definition also leads to the problem of differentiation between 'external' and 'internal' changes in technology. Technological changes put into effect by other industries may affect employment in the railway industry. Moreover, external technological change may, in fact, have a greater impact on the railways than any changes in technology which are occurring in the railway industry itself. Nevertheless, it is obvious that some limits must be set to any inquiry and the problem consists of determining which external changes - if any - should be included.

The purposes of the study would, once again, appear to dictate the analytical criteria for classification, once the phenomenon of 'technological change' is defined on some empirical basis.

In any particular study it is possible to classify all the particular changes in technology into broader types of change on an empirical basis. See footnote references 2/ and 3/.

The empirical classification of individual changes in production technology has to be 'tailored' to the industry or establishment in which these changes are investigated. The result has been that there may be considerable differences in systems of classification from one study to another. See footnote references 2/ and 3/. There differences, however, are usually more apparent than real. The degree of detail desired (that is, the degree of differentiation between individual changes) will usually determine the working definition used. Frequently, several distinct types of changes in one study can be grouped under a different but broader type of definition used in another study.

For instance, one such broad group of changes is included under 'automation'. Contrary to popular usage, the technical use of the word 'automation' refers to a production process which has a number of definite characteristics. The first of these is the utilization of the continuous flow principle and the second is the application, to a significant degree, of self-correcting control devices. 4/ If we use the term in this strict definition, then the incidence of automated processes in industry generally, and in the railway industry in particular, is relatively small when compared to the incidence of technological change in general. Thus, automation is one subdivision among several which can be subsumed under the broader concept of technological change.

In the present study, we shall be mainly concerned with those changes in technology that are internal to the railway industry. The one notable exception will be a brief review of the effects of technological changes affecting the entire transportation industry such as the rise of competing forms of transportation.

2/ E. Weinberg: A Review of Automatic Technology, *Monthly Labor Review*, June 1955, page 3.

3/ Department of Labour: *Technological Changes and Skilled Manpower: The Automobile and Parts Manufacturing Industries*, Sept. 1960, Ottawa.

4/ Edgar Weinberg: "The Effect of Automation on Industrial Relations". *The Monthly Labor Review*, Feb. 1955, page 49.

However, the technological changes within the railway industry itself will not be broken down in fine detail. A specific change in one functional area affects other areas so widely that it was thought advisable to define specific changes more comprehensively. What we will, in fact, look at, are 'clusters of changes' each of which has important employment effects on all occupations and the totality of railroad employment, such as dieselization, the introduction of integrated data processing, as well as other changes of similar magnitude and impact.

To summarize, our concern in this study will be to examine:

- 1) the employment effects, both quantitative and qualitative, of the technological changes in the entire transportation industry as they affect the railways;
- 2) the aggregate effects of changing technology in the railway industry itself; and
- 3) the partial employment effects of some specific 'clusters' of technological change which have occurred in the railway industry during the past decade.

After determining the changes in total employment and some structural changes therein it will be possible to gain an insight into the over-all effects of technological change in the railroad industry during the period under review. In this chapter an attempt will be made to examine in more detail the individual 'clusters' of technological change.

Eight such clusters of technological changes^{5/} were selected for a more detailed examination. These are:

- 1) dieselization
- 2) centralized traffic control
- 3) humpyards
- 4) merchandise services
- 5) trailer-on-flat-car operations
- 6) improved car equipment
- 7) integrated data processing and
- 8) mechanization of the maintenance operations in the Ways and Structures Division.

^{5/} 'Clusters' of technological change should be construed as a group of related changes in technique rather than as a specific single change. As an illustration of this definition, it is well-known that the technique of maintaining the roadbed and rails has undergone vast changes in the last decade. In this case we will be concerned with the effects of using some new type of material, as well as a large number of new machines, rather than the introduction of an individual machine such as the ballast regulator.

At the outset, it is necessary to realize that 1) some of these large-scale changes in techniques have already fully displaced older techniques in the railroad industry. Conversely, 2) other changes, although well-established, can be further expanded in scope, and 3) certain other changes still exist as little more than bold experiments. The hump-dieselization program must be included in the first category. The hump-yard operations should no doubt be classified in the third category (although they have proven their worth elsewhere). The other six clusters can be included in the second category. Of course, some of the latter offer more scope for expansion in the future than others.

Obviously, it will be impossible accurately to pinpoint the manpower or other effects directly attributable to these specific clusters of technological change because - owing to their very nature - their effects are diffused throughout the system and indirectly reach almost all classes of employees. Because of this widespread diffusion of consequences, the task of accurately imputing the effects to individual clusters of technological change would seem to be almost impossible. However, it is feasible to gain a rough idea of how the various specific clusters have affected total labour demand and the occupational structure.^{6/}

Dieselization

The dieselization program began on a systematic basis in the Maritime area in 1950, when the Prince Edward Island operations were completely converted to diesel power. It attained greater momentum on the mainland in 1952, and by 1958 it was practically completed in the entire Maritime area. The dieselization program essentially meant the substitution of diesel electric power for steam power. Generally speaking, diesel engines can achieve higher speeds, heavier loads, and greater operating flexibility than steam engines, all of which is gained at a notably lower cost. A study of the Prince Edward Island operations, carried out shortly after the dieselization program had been completed, indicated that average costs per train mile amounted to about 80 per cent of those in a comparable period before dieselization. Of course, this comparison did not encompass - on the one hand - the relative newness of diesel equipment or - on the other - the greater load per train mile and greater speeds.

In his testimony, before the House of Commons' Sessional Committee on Railways, Airlines, and Shipping, in 1961, Mr. Donald Gordon indicated that - taking 1950 as a base - gross load per train increased 28 per cent by 1960, freight train speed on the average increased 22 per cent, and gross ton miles per freight train hour increased 57 per cent. All these improvements in performance were primarily due to dieselization. Centralized traffic control has also contributed to the more efficient operation of trains.

The use of diesel engines had its main adverse impact on the level of employment in the maintenance and repair field. Potentially,

^{6/} The approach adopted here attempts to indicate trends and approximate magnitudes. In some cases the evaluation of the trend is based on partial data without any proof that the partial data are representative of the whole system. In other instances, heavy reliance is placed on personal interviews with company and union officials who certainly should be able to evaluate more precisely what has been happening than a relatively unfamiliar observer of railway operations. A third source of data is to be found in the two detailed occupational breakdowns which will be analyzed in Chapter 5.

it has similar implications for the running trades. However, up to the present, management and union agreements concerning work rules have largely prevented these effects. Some adverse impact on operating personnel was felt because the diesel locomotive is able to pull longer trains - particularly when several units are coupled together. In all such instances, the units are controlled by a single crew. Apart from this limited impact the recent settlement of the diesel firemen issue is perhaps the first substantive result of this change in technique, but even in this case the actual employment effects will, for the most part, only become evident in the future. Reductions that have occurred in the employment of operating personnel are partly due to fluctuations in the traffic level and to various changes in operating techniques other than dieselization, some of which have adversely affected employment among the running trades.

As Chapter 5 will show, employment in maintenance and running repairs has been very severely affected; partly because diesels require far less service on the road than steam locomotives and, what is more important, require fewer extensive major repairs in the back shops. Moreover, replacement parts are usually bought, whereas most replacement parts for steam locomotives were manufactured in railway shops. In fact, entire locomotives used to be built in railway shops. Thus, it is not only a question of less work at less frequent intervals, but also a shift in the 'make-or-buy' policy.^{7/} Consequently, it is not surprising that the only trade which achieved an increase in employment was that of electrician (who, before dieselization, had little scope in the railroad industry). Conversely, all the other trades experienced declines in employment, particularly those associated with the manufacture and repair of steam locomotives, i.e., boilermakers, blacksmiths, hammersmiths, locomotive carpenters, etc.

Beyond these two broad groups of employees, dieselization has probably had some indirect effect on other classes of employment, some favourable, some adverse. For example, it almost certainly provides an added impetus to the introduction of centralized traffic control on single track lines. Furthermore, higher speeds and greater loads necessitate a heavier type of rail and a better quality roadbed. Due to the known and potential effects, direct and indirect, it is probably safe to say that the substitution of diesel engines for steam locomotives has been an all-pervasive technological change, the potentials of which extend far beyond those observed so far.

Centralized Traffic Control

Centralized traffic control is essentially a system of controlling train movements on the track by a system of signals and switches from a central location. Under this system, signal indications take precedence over train orders and timetables. It usually is installed in conjunction with power-operated switches, but the latter are not a necessary condition; hand- or spring-operated switches may be employed as well.

The installation of centralized traffic control is usually confined to single track lines. Even on a single track line, there are

^{7/} Changes in make-or-buy policy are not confined to locomotive replacement parts of course but are in evidence in other areas of work as well. While it may be desirable to trace their net effect (positive and negative) on employment levels in the supply industries, this problem fell outside the scope of this study.

alternative ways of controlling traffic, one of which is the use of automatic block signals - a significant improvement on the older system by which train movements were directed by timetables and train orders.

The motivation to introduce centralized traffic control on a given track of the road does not often originate from economic considerations alone. The increased degree of control, inherent in a centrally directed traffic pattern by way of signals and remotely controlled power switches, carries with it a higher margin of safety in operations. An examination of the capital costs and projected savings involved in converting various subdivisions to centralized traffic control reveals that, while on certain subdivisions significant gross and net savings are projected, on others a negligible net saving was involved. This indicates that the decision to convert or not to convert is not made on the basis of economic considerations alone.

Another factor in support of the introduction of centralized traffic control is that it enables the railway to reap the full benefits of the dieselization program, i.e., to utilize the potential of the diesel locomotive for higher speeds, heavier loads and tighter schedules.

In the Maritime area a relatively large proportion of the main line track mileage has been already converted to centralized traffic control. The program is being continued and further subdivisions are being considered for conversion to CTC in the coming years.

The savings associated with centralized traffic control could be categorized as follows: reduction of clearing time spent in sidings, elimination of stops, facilitation of movement through yards, reduction in requirements for tractive power due to better utilization, reduction of idle car time, reduction in the maintenance of signals and roadbeds due to the fact that some sidings are eliminated, and, finally, savings on fuel and wages as a result of the reduction in waiting time.

In terms of manpower, the conversion to centralized traffic control affects the operating employees only in respect of the reduction in overtime pay and terminal delay pay, but not with regard to the level of employment. Among non-operating employees, dispatchers, telegraphers, agent operators, levermen, station agents, linemen, signal department employees, work train employees, and employees in the Ways and Structures Division are affected, some adversely, some favourably.

The impact on employment levels in various occupational classifications can be readily seen from the material in Chapter 5. The occupational analysis shows that train masters increased from 2 in 1948 to 7 in 1960, while dispatchers were slightly reduced from 72 to 63 in the same period. Morse operators were reduced from 30 to 19, and telegraphers were shifted in significant numbers to the spare board. At the same time, signal maintainers increased from 31 in 1948 to 66 in 1960 and their helpers increased from 24 to 115 in the same period. Others adversely affected were those connected with freight train operations, extra gang employees, members of building and bridge maintenance gangs, and track maintenance employees, but it is difficult to isolate precisely the effect of centralized traffic control among these groups because other technological changes almost certainly had a greater over-all effect than centralized traffic control alone.

Humpyards

Of all the technological changes that have become available to the railroads during the 1950's, perhaps the most far-reaching, next to

dieselization, is the construction and use of humpyards^{8/} for the sorting and assembling of freight cars. During the decade 1950 to 1960, no such yards were in operation on the CNR system. However, the first one established at Moncton, New Brunswick, during the late fall of 1960, was put into operation on an experimental basis, and by now has reached a high degree of operational efficiency. Shortly after, a very much larger modern yard became operational in Montreal, and some others are in various stages of planning or construction throughout the system. The significance of this technological change justified its inclusion in the discussion, in spite of the fact that its actual appearance on the system does not fall within the time reference of our inquiry.

The magazine Railway Age in 1956 describes such a yard as "one of the nearest approaches to complete automation on a large scale that is used in train operations today".^{9/}

The operation of a modern humpyard is simple. When a train arrives in the receiving yard, a switching locomotive takes over and pushes the series of freight cars up a grade (the hump), from which, under the force of gravity, they descend into the various classification tracks after being uncoupled. The movement of the cars down the grade is governed, both as to speed and direction, by remote control.

In order to make maximum use of this type of arrangement and to aim at a continuous flow operation, the most modern means of communication and electronic controls are usually installed including such equipment as television cameras, radar, and radio communication between locomotives and yardmaster's office.

From the railroad's point of view, the advantages of these modern humpyards are manifold. Not only do they speed up the movement of cars through the yard, but they also reduce the required locomotive hours to complete the operation. In addition, they reduce damage to freight and freight cars thereby cutting maintenance requirements and damage claims of customers. At the same time, they enable the railroad to render a better service to customers in terms of speed and efficiency.

As construction of these yards generally requires a large amount of fixed capital outlay and relatively small additional initial outlays for providing increased capacity, they are usually constructed for a considerably larger volume of traffic than the old flat yards. Consequently, it is not unusual for them to take over the work of several flat yards in the region, and beyond that to reduce both the activity and employment in a number of others in the region.

To illustrate the general points made so far, some specific data are listed below with regard to humpyards in general, and the Moncton yard in particular. The old flat yards of Moncton - 3 in number - had a total capacity^{10/} of about 3,450 cars. The new yards has a total capacity of about 4,300 cars, which can be expanded when needed to 7,600. The Moncton yard and the Montreal yard are each capable of reducing train

^{8/} The CPR had some humpyards in operation prior to that time although the oldest one in Winnipeg did not utilize automatic control devices and a second one established in 1950 in Montreal used such devices to a far lesser extent than the new CNR yards.

^{9/} Railway Age, 14 May, 1956, page 8.

^{10/} Total capacity means room on classification tracks plus the arrival and departure yards.

make-up time, sometimes by as much as 75 per cent. A considerable reduction in engine crews and yard engine hours is possible - up to 60 per cent depending on traffic conditions. The train time through the Moncton yard has been cut 60 per cent, from 10 hours to approximately 4 hours. It enables cars to travel as far as possible without switching. In Montreal the time required from yard arrival to switching the car to the industrial zone has been cut by 75 per cent.

The effect of this technological change on the labour force is quite perceptible in so far as it creates additional manpower requirements for supervisory personnel and among the maintenance trades, particularly in the signal and communication areas. At the same time, engineers, firemen, switch-tenders, yard labourers, and other operating personnel are more likely to be adversely affected. It has been estimated that the transfer of work from the flat yard to the humpyard in Moncton will displace approximately 15 per cent of the positions formerly found in yard work (this is a rough estimate). The estimate does not include the effects of the humpyard operations on the employment levels of other small flat yards in the region, but they will almost certainly experience a slight decline in volume of output and employment.

It should also be pointed out that manpower requirements in the humpyard are somewhat less flexible than was the case in the flat yards. Once the smaller number of positions are established, fluctuations in traffic level have relatively little influence on employment levels. Consequently, the smaller number of employees will presumably enjoy more stable employment than their counterparts in the flat yard. As the humpyard had not been in operation by September 1960, it is impossible to pinpoint the changing demand for various occupations from our employment statistics. On the other hand, other railroads in many countries of the world have had humpyards in operation for some time and, prior to the construction of the humpyards in Moncton and Montreal, the CNR had conducted extensive studies. The foregoing generalizations about employment effects are considered a reasonable approximation of what will ensue in the demand for labour on the CNR system as a whole and in the Maritime area in particular.

The increased efficiency of the humpyard favours the development of a truly integrated transportation service. It was made possible, in turn, by the development of modern communication systems of centralized traffic control. The foregoing points out the difficulty of isolating one particular change or a particular cluster of changes from the rather complex and interrelated technological changes occurring in the economy or in a particular industry. It also justified the decision that was made to examine functional clusters of technological change rather than single instances of changing techniques.

Merchandise Services

Merchandise services as a change in technology can best be characterized as an organizational change. The term merchandise services denotes an integrated transportation service in which various types of transport are co-ordinated to form a system of transportation at the lowest cost and highest efficiency - both at the present level of technology. The primary technological change that makes this possible is the (perfection of the) automobile, in so far as it can transport both goods and persons for short distances more economically and comfortably than the railway. Another factor is the increasing use made of material handling equipment in the transportation goods, as well as the introduction of the diesel locomotive which carries more goods faster over longer distances than its predecessor. These three technological changes, interacting with various others, some of which will be discussed in later sections,

caused the railways to re-examine their operations with the object of streamlining them. Out of this reappraisal was born the plan for an integrated transportation service making full use of the potentialities of modern transportation technology.

What does this plan entail? It envisages a system of transportation where each medium of transport is utilized to the best advantage in the most efficient way. This means that goods will be moved on rail over longer distances to centrally located points, from which they will be distributed by trucks within a district surrounding this central distribution point. Under this plan, passenger traffic as well as the transportation of goods will be concentrated more in larger centres. Buses or self-propelled railway cars will carry passenger traffic, and trucks will distribute the freight traffic, from this central location, within the designated district served by this central point.

This plan may have considerable repercussions on other aspects of railroad operations. It foreshadows the closing of local small stations to some extent and the abandonment of most of the branch lines.

It further raises the question of the rationale of maintaining two separate services, that is, freight and express. It does this because presumably at centrally located master stations enough materials handling equipment would be available so that goods would move quickly and efficiently, even those of a heavy or bulky nature, and therefore the difference in the quality of service between freight and express would be greatly diminished. As trucks would move the goods in an area around the railhead, way freights would be eliminated entirely for less than carload quantities of freight.

This program has, so far, made comparatively little headway in Canada. In the Maritimes, some branch lines have been closed, some shed operations consolidated, a considerable number of way freights eliminated and a couple of stations merged into a larger station. Present regulations, however - both federal and provincial - prevent the institution of the plan in its totality. There are, nevertheless, a great number of truck runs in the Maritime area which, over the years, have taken over, for the most part, the role that was played by the local way freight train. It is significant that the Royal Commission on Transportation in its preliminary report, and the International Labour Organization in its report Social Consequences of Changing Methods and Technique in Railways and Road Transport (Inland Transport Committee, Geneva, 1961), examined this question and viewed the development of such an integrated transportation service with sympathy. While the full implementation of such a plan is still some way off in Canada, due for the most part to legislative barriers, the trends strongly suggest that it will eventually come into existence. Open stations and agencies in the Maritime region numbered 271 in 1948, 264 in 1955 and were reduced to 225 by 1960. On the other hand, the number of scheduled truck routes, as well as employment connected with trucking, has steadily increased over the years, and traffic is becoming increasingly concentrated in the larger stations (the future railheads).

Of course, one of the principal enabling factors already mentioned is that, with the help of mechanical equipment, the larger stations are better organized to handle the consignments and planned plant shipments promptly and efficiently. It is noteworthy in this respect that, as a group, shedmen, stowlers and freight porters declined from 283 in 1948 to 22 in 1960. Similarly, freight loaders declined from 56 in 1948 to 36 in 1960. Their jobs were obviously superseded by operators of loading equipment, whose employment increased from a mere 4 in 1948

to 191 in 1960. At the same time, the employment of chauffeurs, truck drivers and motormen increased from 108 in 1948 to 168 in 1960, reflecting the shift of traffic from rail to road.

Unfortunately, exact productivity measurements are not available for freight shed performance without an examination of the data available in respect of output and man-hours. There seems to be little doubt, however, that the present operation of the freight sheds is a more efficient one than in the past.

There is one aspect of merchandise services that has not been mentioned so far, and that is the trailer-on-flat-car operations, commonly designated as 'piggy-back'. Piggy-back operations have increased rapidly in the recent past. They can, in fact, be expanded still further without any reorganization at all. Because of their character, the trailer-on-flat-car operations are envisaged as a major component of the integrated merchandise services plan. The importance of this operation in the recent past, and the prospect that its importance will further increase, regardless of whether or not a truly integrated transportation system comes into being, indicates that it may perhaps be worthwhile to discuss this service in some detail and separately from merchandise services.

Trailer-on-flat-car Operations (Piggy-back Operations)

Trailer-on-flat-car operations or piggy-back involve the transportation of a fully loaded truck on a railway flat car over long distances. This essentially simple idea has been considerably refined in practice. Using specially constructed flat cars, it is possible to place the fully loaded trailer on the flat car and then unhitch it from the cab and unload it at the place of destination using another cab identical with the one that placed it on the flat car. Thus the goods are moved from the point of pickup to the point of local delivery without handling in between; yet the engine or cab component of the trailer truck remains in one location, thereby taking care of local pickup and delivery. Obviously, this type of transportation service blurs the distinction between local pickup and delivery and long distance transportation on the one hand and railway transport and road transport on the other. It is equally clear that such a service is a prime example of the integration principle applied in the transportation field and thus it is not surprising that piggy-back operations are envisaged as forming an important component of merchandise services.

The advantages of this system of transportation are considerable, and therefore it is of little surprise that in the recent past a considerable expansion of this type of activity has taken place in the transportation industry. In 1960 the tonnage carried by this service was 8.6 per cent higher than in 1959, while the revenue yielded by piggy-back services was 23 per cent higher in 1960 than 1959. By March, 1961, it constituted between 4 and 5 per cent of total revenue car loadings in Canada.

The expansion of this type of service, in the Maritime area specifically, shows an equally impressive increase from year to year. In terms of tonnage it almost doubled between 1959 and 1960, and 1961 preliminary data show an impressive increase over the 1960 level.

Piggy-back operations are, however, only part of a trend towards the increasing use of containers or 'containerization'. The basic idea in using containers is the same as that which underlies the piggy-back operation. The purpose is to eliminate as much handling of the goods in the course of transporting as possible and also to

facilitate the fastest possible movement of goods through the transportation system. In this sense, the piggy-back trailer is nothing more than a type of container, loaded at the pickup site, transported to the point of destination without further handling, and unloaded there. The same principle, of course, can be applied not only between trucks and rail but also between truck, rail and ships or any other combination of transportation means in any sequence whatsoever. All that is needed in this concept is the design of suitable containers, together with the standardization of container types, which would permit a correspondingly high degree of standardization in the material handling equipment used for such containers.

While piggy-back services, as we have seen, are already of importance in the entire transportation industry, and are still growing at an impressive rate, containerization by and large - apart from piggy-back - has not yet developed to any significant extent. Up to the present, the main inhibiting factor has been the lack of standardization with respect to dimensions of containers and the types of fasteners used. There is little doubt, however, that some progress in this respect is likely to be achieved in the future and that the success and expansion of piggy-back services will induce the railways to experiment and institute other applications of the containerization principle in the transportation system.

The manpower effects of such a change are, of course, rather complex. Yet, while they may be difficult to substantiate at this time by actual data, the general implications are reasonably clear. Such a change in technology clearly will reduce manpower requirements for employees involved in the handling of goods in trans-shipment. Further, it will probably adversely affect manpower involved in the maintenance of car equipment as specially equipped newer-type flat cars replace, to some extent, the standard box or other conventional freight car. The secondary impact will probably consist of an increase in employment among groups involved in the manufacture of flat cars, partly offsetting the adverse employment effect of the decreased demand for conventional freight cars. Other secondary effects could very well involve an increased demand for manpower engaged in the manufacture of containers of all sorts. For that reason, employment in the trucking industry may suffer to some extent.

What the primary and secondary effects may turn out to be, will depend largely - one might almost say, decisively - on what happens to the demand for transportation services in general in the future. This assessment is based on the fact that any new application of the containerization principle in the transportation industry, as well as the existing piggy-back system, is bound to lead to a more efficient operation through combining the advantages which are specific to the various means of transport. The increased efficiency of the operation, if reflected in changes in the quality or price of the service, likely the former, will necessarily affect the demand for transportation services in general and railways in particular. It seems likely that the secondary effects via shifts in demand will be of greater importance than the direct effect of the change in techniques on the employment level. It is, of course, unknown to what extent such offset effects would be operative. In any event, it would not be likely to alter the situation appreciably with respect to the greatly changed occupational composition of total labour demand.

Improved Equipment

For the purposes of the report, the term 'improved equipment' refers to new types of equipment (excluding locomotives), new materials

used in the construction of older types of equipment, and new materials used in the maintenance of old equipment. In the light of what is known about the application of technological change in the railway industry, it is reasonable to expect that the stock of equipment at the end of the period under review would be materially different from that at the beginning of the period and, in one respect or another, better or improved.

Among the new types of equipment that have made an appearance during this period, one has already been discussed in some detail - the special-purpose flat car utilized in piggy-back operations. The design and the introduction of this flat car is symptomatic of a trend which is not confined to the movement towards containerization. There is evidence of the railway's attempt to design rolling stock which will perform a given function more efficiently and/or more satisfactorily for the customer. Often, the new design does enable the railway to perform a function which, hitherto, could not be done. Particular examples of this are cars (those equipped to move automobiles) that are fitted with special loading suspension equipment, cars which are designed to transport newsprint in a better condition than in the average box car, refrigerated cars to move perishable traffic, and some other examples still in the experimental stage. The increasing emphasis on special-purpose rolling stock was brought out in the testimony of Mr. Donald Gordon before the House of Commons' Sessional Committee on Railways, Airlines and Shipping in 1961, by the fact that purchases by the CNR in 1960 were confined exclusively to such special-purpose cars. Further evidence of the importance of special-purpose cars is to be found in the active development work that is being carried out on some additional types of special-purpose equipment, notably on a piggy-back flat car which can be loaded sideways.

However, as was pointed out by the President of the CNR, there is an economic limit to the utilization of such special-purpose cars because the return haul is not usually available, and, therefore, the cars must be returned empty.

Thus the relationship between freight car miles loaded and empty has been changing over the years due to the increasing use of special-purpose cars which, by their nature, cannot be utilized as extensively as the general purpose box car. This, of course, is not too significant in the Maritime area because the Maritimes always had a high empty-load ratio. Nevertheless, even in this region the effect of the special-purpose cars is in evidence. It was found that, while in the period between 1948 and 1951 there were approximately between 2.5 and 3.0 loaded car miles for every empty freight car mile, in the later period from 1955 to 1960 there were somewhere around 2.0 loaded freight car miles for every empty freight car mile (this may vary between 1.9 and 2.2).

With regard to passenger equipment, we may note the appearance of rail liners or Budd cars. This type of passenger equipment is designed to replace conventional trains where traffic density is relatively low and, therefore, the operation of the conventional train entails significant losses to the company. The rail liner is designed to save both fuel and labour and thus reduce operational costs. It is perhaps of interest to note that in many cases where studies are available rail liners do not actually convert an uneconomic operation into a profitable one but rather provide services to a community or a group of communities at a minimum loss.

The other significant change in the passenger-equipment field is the use of air-conditioning in all equipment.

Instances of the use of improved and/or new materials in old types of equipment (both passenger and freight) are too numerous to survey completely. To mention the most important, it is to be noted that, due to the superior traction qualities of the diesel locomotive, there appears to be a tendency towards larger-capacity freight cars. Moreover, the larger-capacity freight cars, in turn, necessitate the replacement of journal bearings with roller bearings and the replacement of cast iron wheels with steel wheels. In fact, all the 70-ton capacity freight cars are now equipped with steel wheels and a considerable proportion of the 50-ton capacity cars have already been converted. These changes result in the necessity of replacing bearings and wheels at much less frequent intervals with a corresponding improvement in service and reduction in maintenance requirements, including manpower. Another significant change is the gradual but stable tendency towards using box cars with steel body construction to replace freight cars with wooden bodies. The cars with steel bodies require far less maintenance than those constructed from wood.

The use of improved or new materials can be best appreciated by examining the increasing use of plastics and new types of paint. Plastics, when employed to replace cloth, have proved to be more durable and easier to maintain, while improved paint, both interior and exterior, undoubtedly gives better protection to equipment, thereby reducing the amount of maintenance required.

It is not possible to determine the extent of the manpower effects of these changes in technology. It is known that manpower requirements in the reporting division 'Maintenance of Equipment' were most severely curtailed for two reasons: 1) the use of improved equipment which requires less maintenance; and 2) improved methods, materials and tools in the repair shops which enable the railway to complete the required repairs with less manpower. A third reason, and probably of more importance in terms of locomotives than rolling stock, is the changed make-or-buy policy. As was pointed out in connection with dieselization, there is a tendency to purchase replacement parts which, in earlier circumstances, would have been manufactured by the railway shops. A similar shift in make-or-buy policy is true of car equipment as well, but to a lesser extent.

While considerable improvements have taken place in shop methods over the years, visits to main shops have revealed that, generally speaking, there is still room for a great deal of mechanization and 'automation'. The extensive use of specialized transfer equipment in the machine shops and repair establishments generally seems to be the exception rather than the rule. Furthermore, there are quite a few older non-automatic machines still in operation which, when and if replaced, will certainly be replaced by semi-automatic or automatic machines.

The impact of technological changes on shop occupations seems to be considerable. The almost 30 per cent reduction in the employment of painters from 1948 to 1960, the slightly-over 40 per cent reduction in employment of coach carpenters, the slight increase in the employment of welders in the same period, as well as the shift from the employment of carmen without special qualifications to carmen with special skills, demonstrate the impact on the occupational structure of the improvement in rolling stock. An even greater impact on the occupational structure can be seen when the employment of helpers to these crafts is examined. It is enough to mention that from 1948 to 1960 the employment of carpenters' helpers declined from 17 to 12, helpers to grinder operators and

other production machine operators increased from 2 to 5, carmen helpers declined from 251 to 132, helpers to sheet-metal workers declined from 9 to 2, and helpers to painters declined from 23 to 2.

The impact of improved shop methods is also of considerable importance. In the Moncton repair shop output, measured in work units per man-hour, increased about 60 per cent in the period 1948 to 1959. This improvement in efficiency with regard to repair work in the car shop is of roughly the same magnitude for both passenger car repairs and freight car repairs.

Thus it can be seen that both the use of improved equipment and the improvement in shop methods play a large role in explaining the sizable reduction in employment within the reporting division of 'Maintenance of Equipment'. In addition, the reporting division includes the repair and maintenance of locomotives, and it has already been pointed out that dieselization alone had considerable repercussions on the level of employment and occupational mix.

Integrated Data Processing

In view of the widespread discussions concerning 'office automation', it is perhaps not necessary to discuss what is the character of this technological change. The mechanization of clerical paper work and the use of electronic computers in the office area have already received considerable general attention from mass media, and from scholars in a number of fields. The railway industry is particularly suited to the adoption of these techniques due to the size and complexity of its operations, the control of which has always necessitated a great deal of clerical work.

In the Maritime area, the conversion to integrated data processing commenced in 1956, when the manual payroll operation was converted to a punch card operation. Subsequently, and up to the end of 1960, a considerable proportion of all clerical tasks was converted to computer operations including capital accounting, accounts payable accounting, car tracing and car accounting, revenue accounting, personnel statistics, labour cost distribution accounting, and various other smaller tasks. There is every indication that the conversion of other clerical functions will proceed as larger computers capable of greater speed and capacity appear on the market and are economically attractive to the railway industry.

Integrated data processing systems, while they increase productivity to a very significant degree in the clerical area, actually seem to have increased employment opportunities rather than the opposite. This is due, of course, to the well-known fact that computer systems and mechanical data processing have created a vastly increased demand for information and analysis of the type that was impossible to obtain prior to the introduction of an integrated data processing system. The expansion of employment opportunities in the clerical field, however, perhaps minimizes, but certainly does not eliminate, the individual adjustment problems arising out of the rapidly changing composition of total clerical manpower demands. (See Chapter 6.)

The impact of integrated data processing on occupations is far-reaching. A comparison of employment in the Atlantic region accounting department between 1955 and 1959 shows a decrease in employment for time-keepers, clerks, posters, calculator operators, ledger and payroll typists. On the other hand, clerical occupations specific to integrated data processing made their appearance. In the accounting department

itself, total employment in the period 1955 to 1959 declined from 184 to 168, a drop of about 11 per cent. It is interesting to note that supervisory positions form a larger proportion of the 1959 total.

The detailed occupational breakdown available for 1948 and 1960^{11/} shows a decrease in the clerical group of from 832 to 749: chief clerks and assistant chief clerks decreased from 58 to 45; senior clerks from 31 to 27; clerks from 623 to 553; and typists from 19 to 3. On the other hand, certain clerical occupations which have specialized functional titles attached to them such as cashiers, timekeepers and staff recorders increased roughly by one third.

Among the office machine operators, a group, by the way, into which were classified the newly emerging occupations which did not exist in 1948, it is interesting to note that comptometer and other office machine operators dropped from 40 in 1948 to 16 in 1960. Their place was taken by 71 machine operator clerks, an occupation which did not exist in 1948, a chief clerk machine operator and a 100 per cent increase in communication equipment operators, some of whom are necessary to transmit data to data processing centres.

A reason has already been given for the increase in employment at the supervisory level. To some extent, this can be looked on as a secondary impact of integrated data processing, because the analysis and evaluation of new types of information, as well as a more intensive utilization of previously existing information, necessitate a larger supervisory staff. Moreover, integrated data processing tends to upgrade jobs in the sense that job content changes and involves greater responsibility as well as a greater proportion of time devoted to analyzing and evaluating as against mechanical clerical tasks.

Technological Changes in the Maintenance of Ways and Structures

Technological changes in this area which took place during the decade under review are of several types. They include mechanization of the tasks involved in rail laying and maintenance, use of new and improved materials, and finally some organizational changes.

The maintenance of roadbeds and tracks, as well as the laying of new tracks, used to involve a very large number of unskilled labourers. This is not to say that there were no highly skilled supervisors or workmen involved, but their numbers were, generally speaking, negligible. During the post-war period, a large number of specially designed machines have appeared on the market which, to a large extent, perform the work much more efficiently and quickly. The mechanization of these tasks enables the railway also to improve the quality of the work done, which results in a greater span of time between major repairs on both the track and the equipment which travels on it.

One of the best indications of the degree of mechanization is to be seen in the number and types of machines utilized in track maintenance work at various points in time. There are several ways to approach this problem. Of the 65 kinds of machines existing in the inventory in 1960, 41 were acquired sometime after 1950 and only 24 were of the type which were already utilized by the CNR during the year 1950. Another way of looking at the picture is to compare the number of machines in the CNR inventory in 1950 and 1960. In the former year there were 173 units employed in the area, in the latter 643. As some of the

^{11/} See Table 16 page 62.

machines used in 1950 had become obsolete by 1960 and have been retired for scrap, it is evident that the most of the machines existing in 1960 were of the newer type and were obtained during the decade for the first time. It may be of interest to note that a majority of the machines were, in fact, acquired in the second half of the decade from 1955 to 1960. The trend seems to be by no means at an end. New types of machines or improved machines, which are continually becoming available, have the two-fold effect of raising productivity and reducing the amount of work required.

In addition to the use of specialized machines in track maintenance and rail laying, the use of new or improved materials contributed significantly to the changes in both the level and occupational composition of employment in this reporting division during the years 1948 to 1960.

The use of new materials or improved materials in the maintenance of track and structures typically includes: treated ties, heavier rail, crushed rock ballast, and improved paints and plastic materials in the maintenance of buildings. Of these, only the first is in itself of great importance. Generally speaking, treated ties have a much longer replacement cycle than untreated ties, thus reducing the annual maintenance work (primarily the manual part of it) required by the existing network of track. While the replacement of untreated by treated ties had not yet been completed at the time of this study, the most of the ties had already been replaced by treated ones and the program was proceeding speedily.

The organizational changes are, in a sense, an outcome of the better quality roadbed and the mechanization of work involved in the maintenance of track. There are essentially two types of organizational changes occurring. The first is the establishment of large floating gangs - usually on a regional basis - which perform the work by moving quickly from one area to another by means of motorized transport and are equipped with all the mechanized means at the railway's disposal to perform the job. The other change has been a gradual lengthening of the sections. Due to the improved quality of the roadbed and track, it is now possible for a given number of men under a foreman to control a larger section of the track adequately.

In connection with the new types of rail-laying methods and the use of certain new materials, it is now possible to organize special-purpose gangs which perform a given task very efficiently. Typical of this sort of application is the laying of a new kind of track, that is, one with welded rails, by a 'welding gang'.^{12/} Welded rails are not yet widespread in Canada due to some difficulties with climatic conditions, but in almost every region some instances of welded rail are in evidence.

The steady advance of technology itself and its application by the CNR in this work area are well substantiated by some specific productivity information.

The data indicate that total man-hours per 'equated track miles'^{13/} were 2,423 in 1948 and 1,896 in 1949, after which considerable

^{12/} A 'welding gang' may simply be an old-fashioned mechanized gang with welders added.

^{13/} 'Equated track miles' means a weighted average of various quality track mileage normally used to compare maintenance expenditures.

fluctuations occurred. A high was reached in 1952 with 2,441 man-hours. From this time on, the man-hours per equated track mile held reasonably steady till 1956,^{14/} when large reductions occurred, and by 1960 there were only 1,196 man-hours per equated track mile. In addition to the increase in physical labour productivity, there has been quality improvement of output over the years which is not taken into account by such comparisons.

The impact of these changes on employment has, of course, been quite severe. Not only has the demand for labour been reduced, but it has undergone very extensive qualitative changes as well. The available 1948 to 1960 occupational breakdown of employment in the Maritime area reflects these changes in employment rather accurately. Equipment operators increased from 55 in 1948 to 138 in 1960, an increase of about 150 per cent. Almost every occupation within this group has increased, but of particular interest is the category 'operator track maintenance machinery' in which employment has risen from 15 in 1948 to 40 in 1960. However, while this classification is restricted to the more specialized machinery, the operators of front-end loaders, electric cranes, tractors and bulldozers have increased likewise. As with the operators themselves, similarly with their helpers. While the whole group of craftsmen and operators' helpers have declined from 967 to 439 during the period, cranemen's helpers increased from 3 to 6 and helpers on road maintenance machinery increased from zero to 33.

The lengthening of the sections has resulted in reduced employment opportunity for sectionmen and section labourers. Accordingly, it was found that sectionmen decreased from 1,670 to 1,142 in 1960 and labourers-section from 173 to 83 in the same period. At the same time, section foremen decreased from 353 to 291.

Mechanization of the work, together with some of the organizational changes have, of course, affected the utilization of extra gangs for track maintenance. In this context, attention is drawn to the trend toward larger mechanized gangs. Consequently, foremen and assistant foremen, extra-gang, decreased from 81 to 43 in 1960 and labourers, extra-gang, were reduced from 1,765 in 1948 to 695 in 1960.

On the other hand, the employment of 'extra-gang tool operators' and their helpers has increased in the same period. The job title 'extra-gang tool operators' covering operators of portable power or air tools, was assigned to one job in 1948 and to 15 jobs in 1960. There were no 'extra-gang tool operators helpers' employed in 1948, but 18 employees with this job title were found on the payroll in 1960.

The use of machines and power tools, of course, requires a certain amount of maintenance, some of which is carried on throughout the year, although most of the maintenance is done during the off-season by the operators themselves. Thus the employment of machine operators in track maintenance is much less seasonal than that of the unskilled labourers whom they replaced. Also, some year-round jobs have been created by the use of smaller power tools. In 1960, there were 17 power-tool maintainers employed while none were on the payroll in 1948.

^{14/} 1956 was the first year when a separate work equipment group was organized and the CNR started to move decisively towards rapid and large-scale mechanization of ways and structures work.

The foregoing examples of changing employment levels in particular occupations are but the more dramatic indications of the results of various technological changes in this functional work area.

Needless to say, they do not present the total effect but rather attempt to buttress the general points made in connection with changing technology in the 'Ways and Structures Maintenance' field. The less important but still significant occupational shifts can be easily seen on an examination of the detailed occupational breakdown. Two kinds of occupational breakdowns will be presented in later chapters from which a better appreciation as well as more detail can be obtained with regard to the over-all occupational changes that have taken place between 1948 and 1960 in this particular reporting division.

Other Changes in Technology

The above brief discussions of specific changes do not, of course, exhaust all the technological changes that have taken place in the railroad industry during the decade under review. There are a large number of changes that were introduced either to facilitate the introduction of one or several of the specific changes mentioned or were introduced on their own merit. These, generally speaking, have had a lesser impact on employment levels than the eight discussed in detail but are by no means unimportant. For example, a relatively new technique in various phases of railroad operations is the use of radio telephones for purposes of communication between supervisor and operating personnel located on the jobs. Radio telephone is by now extensively used in large repair shops, and in traffic control and yard operations as well. The extensive use of loading as well as unloading equipment affected in the past, to a considerable extent, the manpower employed in the freight sheds, and this has been discussed on page 16, under Merchandise Services. It should be noted, however, that the use of this equipment is not contingent upon the reorganization involved in the merchandise services scheme although, no doubt, it was an enabling factor.

Let it be noted in passing, therefore, that in addition to the specific technological change clusters discussed in this chapter, there were many technological changes taking place in the railroad industry, ranging anywhere from the very small to the quite significant, which have not been mentioned in this study. The ones covered briefly in this report seem to be simply a sample of large-scale changes which, in the opinion of railway officials themselves, stand out among the others as those which have had the most pervasive, as well as the most significant, impact on employment in the railroads both qualitatively and quantitatively.

The over-all effect of technological change, small- and large-scale, is most readily observed through global productivity data, which will be discussed in the next chapter.

Chapter 3

Productivity

The objectives of firms which change their techniques of production are not usually stated in terms of increased productivity per se, but of greater economic efficiency. Many available techniques that may have great potentiality for labour saving or for lower capital costs per unit output under optimum conditions, may prove uneconomical to particular firms because of such problems as high cost and rapid depreciation of equipment, or of the level of output required to operate the new technique efficiently. Normally, economic efficiency and increased productivity both of labour and capital go hand in hand.

Some degree of cost reduction is usually anticipated by management in all cases of technological change. This may take the form of lower labour and/or capital costs per unit of output, lower costs of alternative raw or semi-processed materials, fuels, etc. In those industries where unit labour costs of output are a small proportion of total unit costs, the reduction of labour costs may be a largely irrelevant consideration in the introduction of new techniques.

Technological changes may also be dictated by the exigencies of competition. By introducing new products or services firms may expand their markets or avoid loss of market to their competitors. As markets expand, economies of scale may be achievable.

Another factor tending to make change attractive nowadays is the possibility, through technical and organizational changes, of achieving greater simplicity of financial, production, and personnel administration. Such new techniques may, for example, provide more readily accessible business information or the possibility of maintaining lower inventory levels than previously, all of which should show up in lower costs, but in the long- rather than short-run.

In this chapter, trends in labour productivity (as measured by manpower requirements per unit output) will be examined. The choice of this measure is dictated by the needs of the study: labour productivity measures provide a first crude assessment of the impact of changing technology on manpower. If a unit of output that formerly required two man-hours now requires one man-hour, and if standard hours worked remain unchanged, output must double or the work force be cut in half (unless a compromise is effected between these alternatives) if the employer is to reap the full benefits of the new technique.^{1/} Labour productivity figures tell nothing about the occupational changes dictated by new techniques, and, therefore, a fuller assessment of the impact of technological changes must await more detailed analysis.

It must be mentioned parenthetically that productivity studies are frequently used in the rather futile attempt to settle objectively the question of whether the benefits of new techniques should rightly

^{1/} An unfortunate feature of the rather crude productivity statistics that were available for this study is that, if management decides not to go to the limit in staff reduction, the potential productivity of new techniques is not revealed until output begins to expand. This helps to explain the sharp increases in productivity that are shown between the years 1954-56 and 1958-60.

accrue to Labour or to Capital. It is not necessary to take a position on this question here, nor should the choice of a labour productivity yardstick be interpreted as a departure from a policy of non-alignment. Labour productivity is examined merely because of its clear relationship to the more detailed analysis that is to follow.

In the railroad industry reliable data are readily available for input and output series. The number of such series, in fact, creates something of a dilemma in deciding which are most appropriate for purposes of productivity measurement. As all have drawbacks as well as attractive features, the problem will be avoided by using them all.^{2/}

Two measures of output have been used. One is a measure of physical output (car miles^{3/}), the other is a measure of revenue output (revenue units^{4/}).

To each of these output measures the following labour input measures have been applied:

- 1) total employment;^{5/}
- 2) total employment excluding that in the reporting division 'General';^{6/}
- 3) total man-hours worked;
- 4) man-hours worked excluding that in the 'General' reporting division (see footnote 6);
- 5) man-hours paid.

Each of these five output measures will be related to the two input measures to yield ten series indicating trends in productivity.

^{2/} In this report, an attempt has been made to use the concepts and techniques which have been developed by the United States Bureau of Labor Statistics in their June, 1953 publication "Productivity Trends, 1935-1951, Railroad Transportation". Some divergencies from BLS concepts occur, but they are, for the most part, of minor importance and dictated by the availability of data.

^{3/} A car mile is a movement of a unit of car equipment a distance of one mile.

^{4/} Revenue units: An artificial measure of revenue output, consisting of revenue ton miles and revenue passenger miles combined in the ratio of 2:1, which reflects the relationship of the two on a revenue basis. The definition of a revenue ton mile is the movement of a ton (2000 lbs.) of revenue freight a distance of one mile. The definition of a revenue passenger mile is the movement of one revenue paying passenger for a distance of one mile. The ratio one to two has been chosen because, on the average, this is the approximate relationship between the real revenue yielded by revenue ton mile and revenue passenger mile respectively.

^{5/} Total employment as used in this chapter is defined as annual average employment in all the occupational groups given in the Monthly Compensation Reports, which includes express and road transportation operations.

^{6/} The reporting division 'General' is made up mostly of office workers and also includes professional and managerial occupations.

All of the data used in these calculations were obtained from various reports submitted by the CNR to the Dominion Bureau of Statistics and the Board of Transport Commissioners, with the single exception of revenue units. In calculating revenue units, the amount of revenue yielding passenger traffic in the Maritime area had to be estimated^{7/} because direct measurements were not available.

The productivity ratios are presented in the form of labour inputs per unit of output. This ratio is not different in its implications from its reciprocal, output per unit of labour input, which is sometimes used in studies of this kind.

Two further qualifications should be made before presenting the series. First, it must be noted that a small number of employees who should have been excluded from the analysis were not. These were mostly employed in ferry services or similar non-railroad operations but are included in the compensation reports. There is no reason to assume that their exclusion would materially affect the trends in the series.

A second point to be kept in mind is that, during the period 1948 to 1960, there were significant fluctuations in traffic levels. A comparison of productivity series with traffic levels shows that traffic levels have a strong effect on productivity. Possible reasons for this have already been referred to. It is necessary, therefore, to analyze fluctuations of the traffic levels in the period 1948 to 1960 before proceeding with the analysis of the various productivity series. The details of these traffic patterns are shown in Table 1.

For the CNR Maritime area, car miles, expressed in the form of index numbers with 1948 as the base year, fell from 100 to 95.41 in 1949, rose to 103.76 in 1951, decreased to 95.88 in 1954, rose to 116.86 in 1958, touched a low of 98.42 in 1959, and rose to 113.65 in 1960. Gross ton miles^{8/} were approximately 20 per cent higher in 1960 than in 1948. During this interval, they reached a peak in 1951 and an all-time high in 1956. Net revenue ton miles^{9/} had the same pattern over time as gross ton miles, with peaks in 1951 and 1956 and low points in 1954 and 1958. However, their over-all increase was only about half as much in percentage terms as that of gross ton miles. It can be observed in Chart A that these three output measures as well as the revenue units measure conform very closely to each other in their general pattern. A different pattern is presented in Chart B presenting two important output series for the period 1948 to 1960 representing the entire 'Canadian Lines' system which has been included for purposes of comparison.

^{7/} The method of estimation was as follows: a relationship was obtained between passenger car miles and passenger revenue miles for the entire 'Canadian Lines' system. This relationship was then applied to the passenger car mile data of the Maritime district. While this may not be very accurate, it was considered to be acceptable primarily because the magnitude of passenger revenue miles to revenue ton miles is usually very small on a system-wide basis as well as in parts of the system. Therefore, even if the error were significant by itself, it would become much less important when combined with revenue ton miles.

^{8/} Gross ton miles - the number of tons (2000 lbs.) being moved one mile in road freight or passenger trains.

^{9/} Net revenue ton miles - the number of revenue producing tons (2000 lbs.) moved one mile in road freight trains.

Table 1
 Output Measures CNR Maritime Area in Index Numbers 1948-1960
 (Base Year 1948 = 100)

| | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 |
|--------------------|------|-------|-------|--------|--------|--------|-------|--------|--------|--------|-------|--------|--------|
| Car Miles..... | 100 | 95.41 | 98.83 | 103.76 | 103.62 | 100.91 | 95.88 | 105.46 | 116.86 | 106.97 | 98.42 | 109.74 | 113.65 |
| Revenue Units..... | 100 | 88.15 | 98.30 | 102.76 | 93.51 | 87.27 | 85.16 | 97.02 | 110.81 | 99.32 | 87.83 | 102.52 | 106.84 |

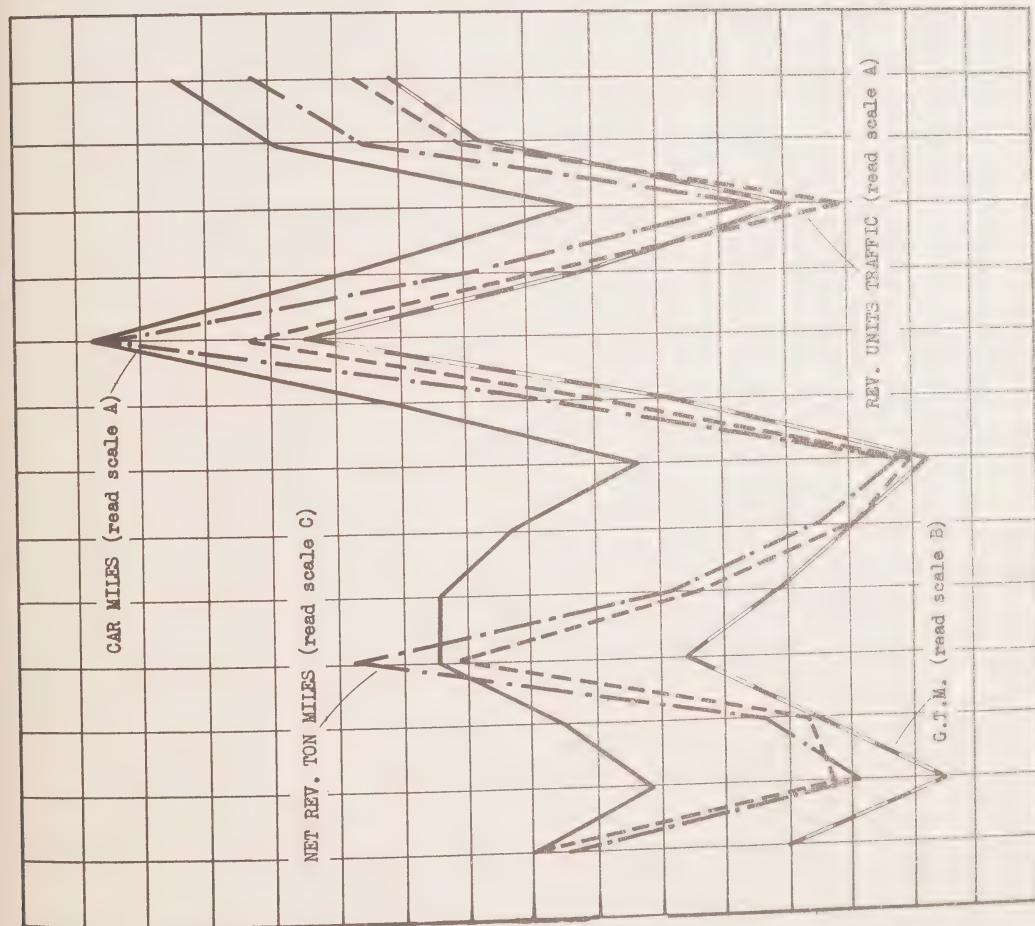
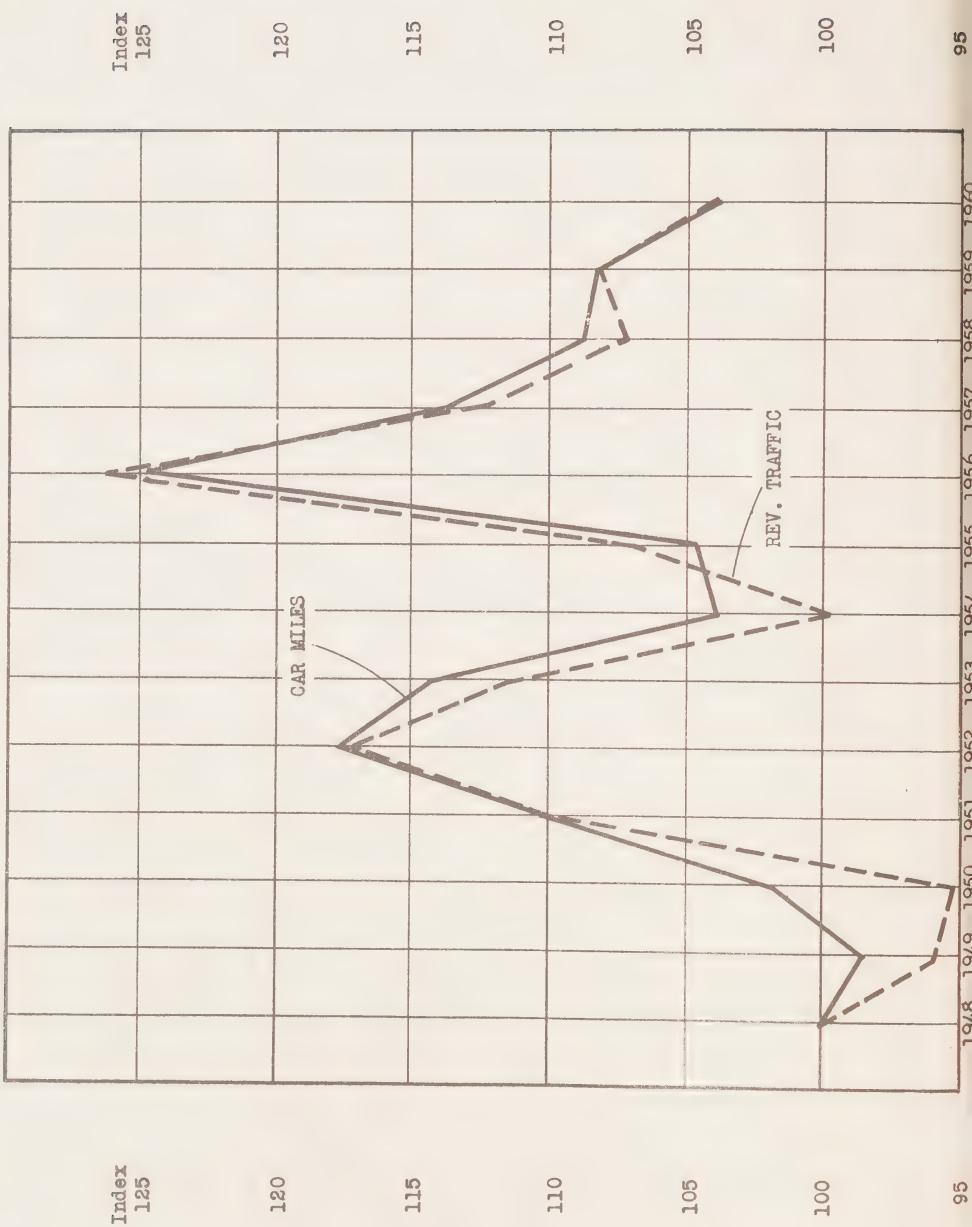


CHART B
CANADIAN LINES
TOTAL CAR MILES
TOTAL REV. TRAFFIC IN UNITS



The output series for the Maritime area show a strongly cyclical pattern with troughs occurring in 1949, 1954, and 1958, and peaks in 1951 and 1956. The cyclical patterns of car miles and revenue units follow each other closely, a closer correlation being evident in the post-1954 period than in the period 1948 to 1954. The comparisons between points in time where there are traffic levels of a rough equality permit some degree of isolation of the effects of technological change on productivity, employment, and components of employment. It should be noted that output, in car miles, is almost identical in the two years 1950 and 1958, while output in 1958 is within 2 percentage points of 1948. Revenue units in 1949, are almost identical to 1958, while in 1959 they are approximately two and a half per cent higher than in the base year 1948 but, in turn, almost identical with 1951.

Table 2 shows what has happened to the various productivity series from 1948 to 1960. It is obvious from an examination of the table that considerable gains in productivity have been made by the CNR in their Maritime area during the period 1948 to 1960.

In terms of 'man-hours worked', labour input requirements per unit output (car miles) have fallen about 34 per cent. The advantage of using the productivity series incorporating 'man-hours worked' as the principal indicator is that it automatically adjusts itself for variations in hours of work during the period under review. Indeed, since in 1948 the predominant standard work week was 48 hours (which has since been reduced to 40), it should not be surprising if variations occur between productivity measurements incorporating 'employment' and those making use of 'hours worked' data.

If we exclude the hours worked by employees who are, for the most part, office workers,^{10/} the gain in productivity is closer to 37 per cent.

Comparing productivity in the two comparable years 1950 and 1958, we find that man-hours per car mile declined approximately 18 per cent where all man-hours were used in the calculation, and declined 22.5 per cent when the 'General' reporting division was excluded. It is further interesting to note that productivity seems to rise whenever the volume of output rises and falls or remains stable when output declines. It is quite evident from examination of the table that all significant gains in productivity were achieved during periods of rising output levels. The reason for this is probably, as already suggested, that the CNR has not attempted to immediately cash in on possibilities for manpower economies during periods of declining output period. Indeed, the material in Chapter 6 on mobility patterns suggests strongly that the company prefers to realize its manpower economies through normal attrition rather than through large-scale layoffs. Thus, the period 1958 to 1960, during which business increased, witnessed further moderate declines in over-all employment in the Maritime area (see Table 26, page 88).^{11/}

^{10/} Occupations in the 'General' reporting division. See Chapter 4 for a description of the reporting units used in the analysis.

^{11/} The requirement that the railways maintain certain minimal services would suggest that in times of falling demand capital equipment would be used at considerably less than maximum capacity. This would also tend to lower labour productivity.

Table 2

Productivity Measurements Relating to the CNR Maritime Area
for Period 1948-1960
(Base Year 1948 = 100)

| | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 |
|--|------|--------|--------|--------|--------|--------|--------|-------|-------|-------|-------|-------|-------|
| Employment per Car Mile..... | 100 | 98.28 | 98.25 | 100.44 | 106.41 | 102.21 | 102.30 | 88.94 | 86.41 | 89.87 | 88.24 | 79.88 | 73.75 |
| Total Employment in Four Functional Divisions per Car Mile..... | 100 | 98.89 | 99.31 | 101.76 | 107.67 | 102.62 | 102.65 | 88.88 | 86.29 | 88.50 | 85.85 | 77.99 | 71.54 |
| Man-hours Worked per Car Mile..... | 100 | 95.44 | 97.53 | 99.55 | 97.57 | 93.55 | 92.75 | 80.51 | 80.00 | 83.33 | 80.08 | 75.82 | 66.21 |
| Man-hours Worked in Four Functional Divisions per Car Mile..... | 100 | 95.87 | 98.71 | 99.10 | 96.38 | 92.37 | 91.47 | 79.11 | 78.59 | 81.20 | 76.18 | 72.91 | 62.67 |
| Total Hours Paid per Car Mile..... | 100 | 96.21 | 95.37 | 100.05 | 98.06 | 94.48 | 93.89 | 82.66 | 81.54 | 85.69 | 82.75 | 75.56 | 69.06 |
| Employees per Revenue Unit..... | 100 | 106.37 | 108.73 | 101.42 | 117.91 | 118.18 | 115.38 | 96.68 | 91.13 | 96.79 | 98.88 | 85.51 | 78.45 |
| Total Employment in Four Functional Divisions per Revenue Unit..... | 100 | 107.03 | 109.01 | 102.75 | 119.31 | 118.65 | 115.57 | 96.61 | 91.00 | 95.32 | 96.20 | 83.49 | 76.09 |
| Total Man-hours Worked per Revenue Unit..... | 100 | 103.30 | 107.94 | 100.52 | 108.12 | 108.17 | 104.43 | 87.52 | 84.37 | 90.28 | 89.74 | 81.16 | 70.43 |
| Total Hours Worked in Only Four Functional Divisions per Revenue Unit..... | 100 | 103.76 | 109.25 | 100.07 | 107.46 | 106.81 | 102.98 | 85.99 | 82.88 | 87.45 | 85.37 | 78.04 | 66.66 |
| Total Hours Paid per Revenue Unit..... | 100 | 104.13 | 105.54 | 101.02 | 108.66 | 109.25 | 105.71 | 89.85 | 85.99 | 92.29 | 92.72 | 80.88 | 73.46 |

Revenue productivity measures^{12/} reveal similar patterns. Hours worked per unit of output declined from 1948 to 1960 by roughly 29.5 per cent; 33 per cent where hours worked by employees in the 'General' reporting division were excluded. Taking input in terms of employees rather than man-hours, the gains in productivity over the same period seem to be about 22 per cent for total employment, and 24 per cent with the 'General' reporting division excluded.

Comparing years that show matching revenue outputs, we find that the gain in productivity in the period 1948 to 1959 was approximately 20 per cent, in the period 1949 to 1958 it was about 13 per cent, and in the period 1951 to 1959 it was 19 per cent. These results resemble those obtained for physical output productivity.

The cyclical pattern previously analyzed is perhaps even more pronounced in the revenue productivity series. The periods of increasing productivity were from 1950 to 1955, from 1955 to 1956 and from 1957 to 1960, although in this last period the lion's share of the gain was registered between 1958 and 1960, while productivity remained almost constant during the period 1957 to 1958.

The detailed occupational breakdown already referred to made it possible to separate out supervisory and non-supervisory personnel, and this has made it possible to calculate some rough productivity measures for the non-supervisory personnel alone, which may be of interest. In 1948 there were 16,792 non-supervisory employees who accounted for 94 per cent of total employment, while in 1960 there were 14,553 non-supervisory employees who accounted for 92 per cent of total employment. As these employment figures refer to one pay period of each year, there is an implicit assumption that the relation between supervisory and non-supervisory employees was roughly equal throughout the year, since the employment figures are being related to output measures which are on an annual basis. Revenue units in 1948 were 4,295,770 and, in 1960, were 4,589,488. At the same points in time, car miles were 221,139,485 (1948) and 251,328,361 (1960).

These figures indicate that revenue units per non-supervisory employee^{13/} increased from 1948 to 1960 by approximately 20 per cent. Car miles per non-supervisory employee rose in the same period approximately 32 per cent. These results are comparable in their general magnitude to the results that were obtained previously by using average annual employment. The small discrepancy is due, no doubt, to the variation between the employment levels in September of the respective years and the annual average.

Table 3 provides some comparable productivity measures for all of the CNR's Canadian railroad operations. If we compare the situation of the entire Canadian Lines system to the Maritime area, we find a number of contrasts (see Charts A and B). First, in terms of cyclical pattern, traffic levels in the Maritimes started to decline in 1951, which did not occur until 1952 in the Canadian Lines taken as a whole. In fact, while car miles declined one fifth of one per cent from 1951 to 1952 in the Maritime area, they increased 6.7 per cent on the 'Canadian Lines'^{14/} system in the same period. While revenue miles declined from

^{12/} The five series on Table 2 where output is expressed in terms of revenue units rather than car miles.

^{13/} This is the reciprocal of the productivity index that is used in the rest of this chapter.

^{14/} CNR railroad operations confined to Canada.

Table 3

Productivity Measurements CNR Canadian Lines
in Index Numbers for Period 1948-1960
(Base Year 1948 = 100)

| | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 |
|--|------|--------|--------|-------|-------|--------|--------|-------|-------|-------|-------|-------|-------|
| Total Number of Employees per Car Mile..... | 100 | 101.46 | 98.66 | 97.99 | 97.52 | 99.14 | 102.05 | 99.15 | 88.63 | 95.89 | 90.74 | 90.12 | 88.41 |
| Man-hours Worked per Car Mile..... | 100 | 99.53 | 96.57 | 98.20 | 92.24 | 91.45 | 92.77 | 90.21 | 81.48 | 86.41 | 82.17 | 80.95 | 77.11 |
| Man-hours Paid per Car Mile..... | 100 | 100.33 | 97.42 | 98.34 | 92.23 | 91.90 | 93.43 | 92.20 | 83.19 | 88.71 | 84.82 | 83.69 | 80.25 |
| Total Number of Employees per Revenue Traffic Unit ^{1/} | 100 | 104.61 | 105.70 | 98.25 | 97.87 | 101.61 | 106.47 | 96.78 | 87.45 | 97.39 | 92.17 | 92.05 | 88.51 |
| Total Man-hours per Revenue Traffic Unit..... | 100 | 102.63 | 103.46 | 98.46 | 92.75 | 93.73 | 96.80 | 88.05 | 83.08 | 87.75 | 83.47 | 81.07 | 77.20 |
| Total Man-hours Paid per Revenue Traffic Unit..... | 100 | 103.45 | 104.37 | 98.60 | 92.56 | 94.18 | 97.49 | 90.00 | 82.08 | 90.09 | 86.15 | 83.81 | 80.35 |

^{1/} In order to calculate revenue traffic units, no estimation was necessary because revenue passenger miles were available on the Canadian Lines system directly from CNR data.

1951 to 1952 by approximately 18 per cent in the Maritimes, they rose 6.5 per cent on the 'Canadian Lines' system in the same period. The other marked contrast is evident in the traffic pattern after 1958. On the Canadian Lines system both car miles and revenue traffic units continued to decline, and by 1960 they were 5 percentage points and 3 1/2 percentage points, respectively, below the 1958 levels. On the other hand, in the Maritime area, car miles rose about 14 per cent from the 1958 level, and revenue traffic units rose about 10 per cent, regaining a major share of the drastic decline from the peak of 1956 to the trough of 1958.

It seems evident from a comparison of Tables 2 and 3 that, in the Maritime area, larger productivity gains have been achieved than in the system as a whole. This may be due to a number of factors, not the least important of which is the fact that the CNR happened to introduce new techniques and technological innovations in their easternmost region before proceeding to incorporate them across the system to the west. This policy should, other things being equal, make the Maritime area a high productivity region within the system, which is borne out by a comparison of actual productivity figures.¹⁵

The close relationship between fluctuations in traffic level and the behaviour of the productivity time series, which were noted in the data for the Maritime region, are also evident in the data from the entire 'Canadian Lines' system. One exception to this, in the 'Canadian Lines' data, is the fact that during the three years from 1957 to 1960 further gains in productivity have been achieved in spite of the fact that traffic levels kept dropping.

In the United States the experience has been different from ours. While traffic levels in the Maritime area and the entire 'Canadian Lines' system of the CNR have been rising, in the U.S. traffic levels have been declining. In spite of this, productivity gains of roughly 42 per cent have been achieved by the U.S. railroad industry in the comparable time period, in terms of both 'man-hours input per car mile' and 'man-hours per revenue traffic unit'. These series are roughly comparable to the 'man-hours per car mile' and 'man-hours per revenue unit' used in this study, both of which show gains of only 34 and 33 per cent respectively in the CNR Maritime area. The other remarkable feature of the United States data is that no loss in productivity is evident, even for short periods, such as was found to be the case in the CNR Maritime area during periods of declining traffic levels.

Both the U.S. and, to some extent, the 'Canadian Lines' data suggest that the correlation between traffic levels and productivity trends is essentially a short-run phenomenon. Expectations of gains in traffic may tend to lead the company to retain employees on the payroll and employ them on 'non-productive' projects. Should these expectations be disappointed, management can quickly adjust itself to the changing situation, revise its expectations, and cut down on its demand for labour. Another factor may be the fact that 'overhead' employment such as regular maintenance of roads, buildings, and equipment injects an appreciable degree of inflexibility into the manpower requirements of the railroads.

¹⁵/ Perhaps too much should not be made of this comparison because of difficulties in assessing the comparability of the two sets of data. On the other hand, it should be possible to place considerable confidence in the comparison of productivity trends.

However, once expectations are adjusted to a continually lower level of traffic, buildings and roads may be abandoned and equipment scrapped, leading to a reduction in this component of manpower demand.

Out of all the material in this chapter, the fact of greatest significance for the further development of our topic is simply the over-all gain in productivity that occurred over the period under consideration. It is of interest to observe that, if the total gain is divided by the number of years over which it was achieved, the resulting annual average gain is not greatly different from (perhaps slightly less than) the average productivity gains achieved by the entire economy during the post-war period.

A further observation was the positive correlation between rising traffic levels and gains in productivity. A corollary observation, e.g., that such positive correlation is a short-run phenomenon is also of considerable importance as an explanation of some of the cyclical peculiarities of the Maritime area productivity data.

Lastly, it was determined that the Maritime area became a relatively high productivity area within the system by the late 1950's. This was attributed to the fact that, in practice, it participated both earlier and more extensively in the various programs of technological change.

It is obvious that over-all productivity data are, in themselves, of limited analytical value. They are the result of changes in the quality and quantity of investment, employment, and output. The next task is to attempt to analyze the changes that have taken place in the level and composition of employment in the area.

Chapter 4

Aggregate Changes in Employment

This chapter deals with trends in employment in the Maritime area of the Canadian National Railways. We are now getting to the heart of our topic. For the present, we will look at what has happened to the composition of employment - taken in fairly large aggregates. In Chapter 5 we will attempt to make a much more detailed occupational analysis.

The employment data on which the analysis in this chapter and the next is based are of two kinds. First, there is the employment information which is filed by the railways with the Board of Transport Commissioners and the Dominion Bureau of Statistics every month and every year in the so-called "Monthly Compensation Reports".^{1/} These data are divided into 84 occupational groupings, which fall into five employment areas (so-called 'reporting divisions').

These five reporting divisions are: Maintenance of Ways and Structures; Maintenance of Equipment; Transportation; Other Operations; and General. The titles of the first three divisions also indicate their functions. For analytic purposes it has proven convenient through most of this study to subdivide the transportation division into, Transportation: train, including those employees who are directly involved in the operation of trains, and, Transportation: non-train, comprising those who are not directly involved in the operation of trains. These subdivisions will frequently be treated as though they were reporting divisions in their own right. The 'Other Operations' division consists of employment in communications, express, cartage, highway-rail transport, and outside operations. While reference will be made to this division from time to time, it will be excluded, for the most part, from the main analysis. The fifth division - 'General', consists of all employees who

^{1/} The technical details of this reporting base are described in the Dominion Bureau of Statistics publication Canadian Classification of Railway Employees and their Compensation - Effective January 1, 1956. Before January 1, 1956, a different classification was used to report employment to DBS and the Board of Transport Commissioners. Considerable difficulty was encountered in adjusting pre-1956 reported employment data to conform with the reporting base subsequent to January 1, 1956. With the help of railway officials, a method was eventually developed whereby such adjustments could be made with a sufficient degree of accuracy to permit the creation of a historical time series for the period 1948 to 1960. Due to the nature of the adjustment process, the cruder the subdivision of total employment, the more accurate are the results of the adjustment process. Consequently, if the five functional divisions are adjusted they prove more reliable than any of the 84 occupational groupings individually. While, in spite of extensive work, some doubt exists as to the accuracy of this adjustment process with regard to a small minority of the 84 occupational groupings, it is reasonably certain that, in the case of a large majority, they do constitute a true and accurate time series.

cannot be classified into the other four divisions.^{2/} All information regarding employment levels that originates from this source is available in terms of monthly averages.^{3/}

The second source of employment information is of an entirely different character. Data for an extremely detailed occupational breakdown, which consists of 1,114 individual occupations, were obtained from the records of the CNR for the pay period beginning September 2, 1960. Subsequently, the payroll records for the same period in 1948 were obtained, and each individual on the payroll at that time was individually classified into one of the 1,114 occupational categories of the 1960 data.^{4/} This procedure yielded a comparison of employment levels in all of these occupations for corresponding pay periods in 1948 and 1960. This detailed occupational breakdown proved very useful in constructing some large aggregates, which had proved to be impossible to extract from the Monthly Compensation Reports.

Between 1948 and 1960 total employment for all five reporting divisions dropped from an annual average of 17,171 in 1948 to 14,633 in 1960, a decrease of 15 per cent. This was a period during which physical output had increased by about 14 per cent and revenue output by about 7 per cent; in addition to which average hours of work had been reduced significantly. The standard work week in 1948 was 45 hours; in all three of the terminal years it was 40 hours. Due to the fact that hours of work had changed, it is necessary to say something about the relative importance of overtime work during this period.

As for total employment in the 79 occupational groups of railway operations proper, there does not seem to be any significant increase in the amount of overtime work during the period 1948 to 1954. However, after 1954 and until 1959, a generally higher proportion of total hours worked is indicated as work at overtime rates. From 1959 to 1960 this proportion declined and seemed to be at a somewhat lower level than in the period 1948 to 1954. While the pattern is clear, the magnitudes involved are rather small and are not too significant with respect to the total employment situation. Evaluation is rendered even more difficult by the well-known fact that before employment increases under the impact of an expanding output, industry generally, the railway industry not excepted, first tends to intensify its use of the existing labour force rather than hiring additional personnel. The reverse is also often

2/ It contains, for the most part, office personnel, executives and officers, as well as professional and subprofessional assistants, and, in general, workers whose duties are not related specifically to one division but rather to the whole of company operations.

3/ The term 'monthly average' is used here to designate a magnitude which the railway calls 'mid-month count'. This is a count of all employees receiving pay in the first pay period of the month. While this may differ slightly from a true monthly average of employment, the difference should not be great. At any rate, as the information is uniform throughout the period, and the interest centres on relative changes, any bias that may exist should be of very small importance.

4/ The number of occupations relevant to this study was slightly less. The total of 1,114 occupations included 59 in ferry services, 102 in hotels, 47 in communications. Thus the total number of railroad occupations in the classification (including highway services and express) was 906, of which 24 are occupations in express operations.

asserted, i.e., that when a reduction in output occurs, overtime work is affected first. Indeed, both assertions are borne out by the data obtained from the CNR for the Maritime area.

In the Express Department the pattern exhibits similarities as well as differences in comparison to the railway occupations. Overtime hours, as a proportion of total hours worked, do tend to be higher in the 1955 to 1960 period than in the period 1949 to 1954. However, a reduction in this ratio started in 1956 (rather than in 1959 as in the railway occupations) and resulted in a lower ratio each year until 1960 when the ratio of overtime to total hours was no higher than in 1948.

The impact of fluctuations in the level of traffic can, therefore, be seen as clearly in this time series (overtime) as in the employment series. The only difference between the behaviour of the two time series seems to be a time lag which shows up in the employment series but not in the overtime series.

Both reduction of hours of work and the lower proportion of overtime hours worked in 1960 relative to 1948 provide further clarification of the improvement in the relationship of labour input to output evident from the productivity series discussed in the previous chapter. It would be obvious, even lacking other information, that production techniques must have been changed during this period. As an indication of changing production techniques, it would be appropriate at this stage to discuss what has happened to investment in the region by the CNR. Unfortunately, the information is uneven in quality and somewhat spotty in detail. Due to changes in accounting practices, as well as the difficulty of deflating current dollar figures, the information given in Table 4 is presented with serious reservations as to its accuracy. We may, however, indicate the general trend. The current dollar series in both gross and net investment is deflated first by a GNP deflator and second by a CNR material price index which reflects the price movements of materials purchased by the CNR. While neither of these deflators is entirely satisfactory, they do tend to put the current dollar investment figures into a more realistic perspective.

Table 4

Gross and Net Investment
CNR Maritime Area 1948-1960
(000 dollars)

| | In Current Dollars | | In Constant Dollars (GNP Deflator) | | In Constant Dollars (CNR Materials Price Index) (Old) | |
|------|--------------------|--------|------------------------------------|---------|---|----------|
| | Gross | Net | Gross | Net | Gross | Net |
| 1948 | 3,482 | 1,509 | 3,623.3 | 1,570.2 | N.A. | N.A. |
| 1949 | 3,435 | 1,447 | 3,435.0 | 1,447.0 | 3,925.7 | 1,653.7 |
| 1950 | 4,361 | 2,045 | 4,229.9 | 1,983.5 | 4,900.0 | 2,297.8 |
| 1951 | 5,947 | 3,323 | 5,212.1 | 2,912.4 | 6,080.8 | 3,397.8 |
| 1952 | 5,680 | 2,105 | 4,741.2 | 1,757.1 | 5,646.1 | 2,092.4 |
| 1953 | 6,812 | 3,165 | 5,662.5 | 2,630.9 | 6,678.4 | 3,102.9 |
| 1954 | 7,680 | 3,176 | 6,233.8 | 2,577.9 | 7,680.0 | 3,176.0 |
| 1955 | 5,039 | 1,829 | 4,070.3 | 1,477.4 | 4,989.1 | 1,810.9 |
| 1956 | 10,740 | 7,334 | 8,364.5 | 5,711.8 | 9,853.2 | 6,728.4 |
| 1957 | 9,765 | 6,574 | 7,292.8 | 4,909.6 | 8,598.8 | 5,848.8 |
| 1958 | 12,684 | 9,239 | 9,299.1 | 6,773.5 | 11,416.7 | 8,315.9 |
| 1959 | 16,021 | 11,549 | 11,427.2 | 8,237.5 | 14,291.7 | 10,302.4 |
| 1960 | 15,850 | 11,434 | 11,185.6 | 8,105.2 | N.A. | N.A. |

While we have these reservations about the exact magnitudes of investments, there seems to be little doubt that a rising level of investment has taken place both in gross and net terms, particularly since 1956. This would imply not only that increasing capital investment has taken place per employee, but also that production has become, during the twelve years under review, more capital-intensive with respect to units of output.

Table 5 shows the trend in employment for the various reporting divisions using 1948 as the base year for comparison. We may notice first that, comparing 1948 and 1958, two reporting divisions have expanded employment not only relative to the total of the five divisions but in absolute terms relative to the 1948 base. One of these, the reporting division 'General', consisting of various clerical and staff workers, does not cause any surprise. On the other hand, the reporting division 'Transportation: non-train' which includes employees concerned with the operations of trains, but not serving on them, does seem to show an expansion of job opportunities that is difficult to explain.

Among the three reporting divisions which show declines in employment, the most serious decline was registered in the area of equipment maintenance. Employment in the 'Ways and Structures' reporting division fell by 1958 to roughly 76 per cent of the 1948 employment while in the reporting division 'Transportation: train' the decline in employment was slightly less severe.

Table 5

Employment and Main Components (Based on Annual Averages)
CNR Maritime Area in Index Numbers 1948=100,
Selected Years

| | 1948 | 1957 (Revenue Traffic Approximately Equal to 1948) | 1958 (Physical Output Volume Approximately Equal to 1948) | 1960 |
|--|------|--|---|--------|
| General..... | 100 | 113.78 | 109.57 | 107.28 |
| Ways and Structures..... | 100 | 84.08 | 75.94 | 72.10 |
| Equipment..... | 100 | 81.96 | 69.67 | 62.18 |
| Transportation: train ^{1/} | 100 | 91.29 | 77.63 | 75.97 |
| Transportation: non-train ^{2/} | 100 | 118.15 | 112.38 | 110.25 |
| Subtotal (5 divisions).... | 100 | 93.95 | 84.50 | 80.71 |
| Total Including 'Other Operations'..... | 100 | 94.81 | 88.60 | 85.22 |

^{1/} Includes occupational groups Nos. 68-79 incl. per DBS post-1956 classification.

^{2/} Includes occupational groups Nos. 46-67 incl. per DBS post-1956 classification.

It is also interesting to note that a decline in employment can be observed in all five reporting divisions from 1957 to 1958, as well as from 1958 to 1960. These contractions in the volume of employment must, of course, be viewed against the changing volume of traffic. Physical volume (car miles) declined from 1957 to 1958 and increased almost 15 per cent from 1958 to 1960. A very similar pattern occurs for the volume of revenue traffic. This raises the question of how further manpower economies were effected in the period 1958 to 1960 in the face of a sharply increasing volume of output. The answer to this seems to be, as mentioned in the previous chapter, that the magnitude of the technological changes over the decade, together with increasingly efficient use of manpower, provided the company with excess capacity over and above that required even for its increased volume of business.

Total Employment by Skill Levels

An attempt has been made to analyze the changing skill composition of the total work force of the Maritime area of the CNR, using the 84 occupational groupings in the Monthly Compensation Reports. This attempt has not been very successful, on the whole, due primarily to the fact that a large majority of these occupational groups apparently contain employees at various skill levels. In addition, the proportion of employees in the groups with mixed skills has been increasing since 1948. It was found that 81 per cent of all employees in 1948 and 1949 were in occupational groupings which were apparently homogeneous as to skill content, whereas in 1959 and 1960 the percentage was 60 per cent. The classification of these occupations according to skill level was done by railway officials which, in itself, may make the data of some interest.

Table 6, which presents the results of applying this classification, has the additional disadvantage of being limited to those occupational groups which are clearly homogeneous as to skill level. The Table indicates an increase in the general skill level over the total period under consideration. The unskilled group is the only one showing a sizable reduction, while the skilled group registers the largest gains. The semi-skilled group shows a slight increase, while, at the technician-semi-professional level, the proportion of employees remains stable. It is interesting to note that these changes are all concentrated in the second half of the period. The 1953 to 1955 average reveals a trend in skill composition that is exactly the reverse of what occurred over the entire period of the study.

Table 6

Skilled Classification of Total Employment, CNR, Maritime Area
(rounded to nearest 0.5%)^{1/}

| | | Profes- sional | Semi- Profes- sional | Skilled | Semi- Skilled | Unskilled |
|------------|-------------------------|-------------------|----------------------------|---------|------------------|-----------|
| (per cent) | | | | | | |
| Average | 1948-1949 | - | .5 | 24.0 | 37.0 | 38.5 |
| Average | July 1953- July 1955 | - | .5 | 23.0 | 36.0 | 40.5 |
| Average | 1959-1960 | - | .5 | 28.0 | 38.5 | 33.0 |

^{1/} Skill designations of the 84 occupational groups performed by railway officials.

Table 7

Skill Classification of Total Employment, CNR, Maritime Area
Skill Classification Devised by Department of Labour

| | Professional | Semi- Professional | Skilled | Semi- Skilled | Unskilled |
|------------|--------------|-----------------------|---------|------------------|-----------|
| (per cent) | | | | | |
| 1948 | .29 | .67 | 29.93 | 18.20 | 50.91 |
| 1960 | .67 | 1.16 | 30.78 | 24.86 | 42.53 |

A second analysis of changing skill composition, based on the 906 occupational classifications, broadly confirms the changes indicated in Table 6. The results of this analysis are shown in Table 7. In this classification, the skill designations of various individual occupations differ from those in Table 6. Each individual occupation was examined and given a skill classification according to the writer's appraisal. After individual jobs were assessed in terms of skill, employment in the various skill categories was tabulated on the new basis.

The marked increase in average skill level shown in this Table is particularly evident in the professional and semi-professional categories. This, while of significance, presents a somewhat exaggerated picture of the structural development in railroad operations. Although some small portion of this increase is due to upgrading of job titles, a more significant part of it is due to decentralization. This is important in the sense that executive and professional functions, which used to be performed at head office, are now being relocated to the regional level. As our inquiry is concerned with the Maritime area only, we find a rise in corresponding employment categories when the performance of certain functions is shifted from head office to the regional office.

The difference in the results obtained from the two evaluations of occupational skill is, as the figures indicate, considerable, showing major increases at the semi-skilled, rather than at the skilled level. As there is no accepted yardstick for measuring degrees of skill which would be particularly appropriate in this instance, we may say that neither breakdown is 'better' in any absolute sense. The purpose in making the second skill evaluation based on the detailed occupational breakdown was to ensure that the classification would be consistent for both 1948 and 1960. There is also the advantage of being able to make tabulations for the entire work force at both these dates, which was impossible using the less detailed occupational classification.

Table 8 presents results for the communications department. It will be noted that the skill distribution here was different from that of railway operations proper, and also that different trends in skill composition are revealed. Two features of the changes over time are: the relative reduction of skilled people, and the much larger increase in the semi-professional category, than was found in the railway operations.

Table 8

Skill Classification of Communications Department, CNR, Maritime Area
Skill Classification Devised by Department of Labour

| | Professional | Semi-Professional | Skilled | Semi-Skilled | Unskilled |
|------------|--------------|-------------------|---------|--------------|-----------|
| (per cent) | | | | | |
| 1948 | - | .26 | 17.57 | 56.07 | 26.10 |
| 1960 | - | 3.80 | 15.48 | 58.38 | 22.34 |

Supervisory and Non-Supervisory Employees

The detailed occupational breakdown has been used to assess trends for certain groups of workers who were merged into the 84 occupational groupings beyond possibility of extraction. The first of these is the supervisory group. Classification into this group is based entirely on job titles: typical titles which were considered as supervisory jobs were supervisor, superintendent, trainmaster, yardmaster, officer, manager, inspector, general foreman, etc. It was found that the change in this group during the period was as follows:

| Year | Supervisory Employees | Supervisory Employees as Percentage of Total Employment |
|------|-----------------------|---|
| 1948 | 1,017 | 6.06 |
| 1960 | 1,209 | 8.37 |

Here again, upgrading of job titles and decentralization of managerial functions tend to have the effect of raising the proportion of supervisory employees in the Maritime area.

Office and Non-Office Employment

The detailed occupational classification was also used to obtain a breakdown between office and non-office employment. The office group was further subdivided into 'executive' and 'other' categories. Table 9 indicates that, between 1948 and 1960, the number of executives more than doubled, the 'other office' group increased moderately in numbers and substantially as a percentage of total employment, while the non-office group declined substantially in both absolute and relative terms.

Table 9

Employment on CNR, Maritime Area

| | Executive | Office Employment | Non-Office Employment |
|------------------------------|-----------|-------------------|-----------------------|
| 1948 | 24 | 1,724 | 15,431 |
| Per Cent | .14 | 10.04 | 89.82 |
| 1960 | 54 | 1,945 | 12,948 |
| Per Cent | .36 | 13.01 | 86.63 |
| Per Cent Change 1948-1960 | +157 | +29.58 | -3.55 |

Seasonal Fluctuations of Employment

There is one other aspect of the broad employment picture that appears to be worth analyzing, and this is the seasonal patterns of employment in the Maritime area of the CNR. For the purpose of this analysis, employment data in the five reporting divisions, their total, and the total employment including 'Other Operations', were seasonally adjusted, using the 'Census Method No. II'. This method analyzes the data into three components: trend and cycle, seasonal, and irregular.^{5/}

There are two questions of interest involved in this analysis. The first is: How did seasonal fluctuations in employment compare with various other employment series in Canada and in the Atlantic region? The second is: In what way, if any, has the seasonal pattern of employment in the CNR Maritime area changed over time from 1948 to 1960?

With respect to the first question, various comparative standards were provided by Mr. F. J. Doucet and Dr. Gil Schonning of the Economics and Research Branch, Department of Labour, writing in the Labour Gazette of May, June, and July, 1960. For the period 1953 to 1959 they find that the average percentage deviation per month (of a seasonal nature) for the series 'Persons With Jobs in Canada' is 2.8 per cent. The same deviation for the Atlantic region is 5.6 per cent, indicating that seasonal fluctuations are twice as pronounced in this region as in Canada as a whole. If only persons with jobs in non-agricultural industries are taken into account in the Maritime area, it was found that over the same period the average monthly deviation is 5.1 per cent.

Our data indicate that in the same period the average percentage deviation per month due to seasonal factors for the CNR Maritime area amounted to 2.7 per cent with respect to both the series including, and the one excluding, 'Other Operations'; showing, in other words, fluctuations of smaller magnitude than any of the series presented by Mr. F. Doucet and Dr. G. Schonning.

Not surprisingly, considerable variation exists between the various reporting divisions with respect to the seasonality of their employment. 'Maintenance of Equipment' and the reporting division 'General' showed the lowest seasonal amplitudes, namely, one per cent for both. The division with the greatest seasonal swings in employment is the reporting division 'Maintenance of Ways and Structures', with an average deviation of 9.3 per cent. The 'Transportation: non-train' division shows a relatively low 2 per cent, and the 'Transportation: train' division shows an average monthly percentage deviation of 3.6 per cent. Thus the greatest seasonal variations are shown by the reporting divisions 'Maintenance of Ways and Structures' and 'Transportation: train', both of which exceed the magnitude of seasonal variations in employment of persons with jobs in Canada as a whole.

Table 10 provides some answers to our second question (i.e., How did seasonal patterns of employment change over time?). We note in

^{5/} It should be noted that in all of these series the irregular factor, i.e., the residual unexplained variation in employment levels, is extremely high. In very simple terms, this means that month-to-month variations in employment in the CNR Maritime area cannot be explained solely by trend, business cycle, or seasonal factors, as the apparently contain a sizable random variation. The data were analyzed over a fourteen-year period, of which only the twelve years 1958 to 1960 have been used in this section.

this table that five of the seven employment series display a lower degree of seasonality in 1960 than in 1948. Only two of the reporting divisions (the two subdivisions of the transportation division) display a higher degree of seasonality than in 1948. On the other hand, all seven employment aggregates display considerably higher degree of seasonality in 1960 than the lowest degree achieved during the period under review.

The trend in recent years towards increasingly greater seasonal swings in employment is probably more significant. The only two exceptions to this are the reporting division 'General', in which the degree of seasonality in recent years appears to be steady, and the 'Maintenance of Equipment' group, in which the seasonality of employment has declined quite significantly in recent years.

For anyone interested in the detailed information regarding both the changes in seasonality in employment in the various reporting divisions over time, and a brief analysis of the high irregular factor in all of these series, such information is provided in Appendix II at the end of the report.

Table 10

Seasonal Patterns of Employment

| | Degree of Seasonality in 1960 Relative to 1948 | Degree of Seasonality in 1960 Relative to Lowest Degree Achieved in Period 1948-1960 | The Trend in the Degree of Seasonality in Recent Years |
|---|--|--|--|
| Employment in 'General' | lower | higher | stable |
| in 'Ways and Structures' | lower | higher | increasing |
| in 'Equipment' | lower | higher | decreasing |
| in 'Transportation: non-train' | higher | higher | increasing |
| in 'Transportation: train' | higher | higher | increasing |
| Total Employment Including 'Other Operations' | lower | higher | increasing |
| Total Employment Excluding 'Other Operations' | lower | higher | increasing |

Summary

In retrospect, an examination of changes in large employment aggregates indicates that, while total employment in the area declined from 1948 to 1960, employment opportunities increased somewhat in the 'General' and the 'Transportation: non-train' divisions, although both have been declining in size since 1957.

The most striking decline in employment occurred in the area of equipment maintenance, but the reduction in the number of jobs in the area of maintenance of ways and structures was only slightly less severe.

Notwithstanding the uneven distribution over time of both declines and increases in employment, it is important to note that, in the years 1958 to 1960, further reductions in personnel were possible even in the face of increasing volume of output.

It was further found that a significant increase in the skill composition of the labour force took place over the period.

In the period 1948 to 1960 a shift occurred towards employment of a larger proportion of employees in supervisory or executive capacities, as well as in office work.

There were some interesting findings concerning seasonality of employment. First it was shown that the railway does provide relative stability of employment when compared to the rather strong seasonal fluctuations in total employment in the area. It is also shown that in 1960 the seasonality of employment in the CNR was less than in 1948, but higher than already achieved in the past during the period under review. Moreover, in recent years, seasonality of employment has tended to increase.

Chapter 5

Analysis of Occupational Changes

In this chapter an effort will be made to examine in greater depth the two basic sets of data introduced in the previous chapter^{1/} and to describe in detail the occupational changes that have resulted from changing technology. Some effort will also be made to examine the timing of these occupational changes.

Information from the Monthly Compensation Reports

The material to be considered in this section is presented in Tables 11-15. These Tables present employment averages for the years, 1948, 1954, 1958, and 1960. 1954 was chosen as a reference date because it splits the period of the study in half, and the year 1958 was used because, as will be recalled, there is a close relationship between the volume of physical output (car miles) for this year to the year 1948.

Tables 11-15 all have the same format, and are divided into seven columns. Column 1 provides the actual numbers in each occupation in the year 1948. Many of these occupations involve very small numbers of workers, and it therefore becomes a matter for individual interpretation as to whether or not even rather striking percentage changes are of any actual significance. Columns 2 to 4 give the percentage change for each occupation between the year 1948 and the years 1954, 1958, and 1960 respectively. Column 5 provides the percentage change in employment between the years 1958 and 1960. It will be recalled that physical output increased by 15 to 22 per cent between 1958 and 1960, depending on the output measure that is used. In columns 6 and 7 a statement is provided as to the relative change of each occupation over the period 1948 to 1958, as compared, respectively, to the change over the same period in total CNR Maritime employment, and to the change that occurred in the particular reporting division in which the occupation is located. The information in these Tables will permit some observations concerning the timing of occupational changes. The importance of the timing of occupational changes stems from the fact that during the first half of the time period of the study most of the major technological changes that need to be considered were in the planning or introductory stages, while during the second half, a number of major innovations were in large-scale operations.

We now go on to examine what occurred in each of the five reporting divisions.

1. The 'General' Reporting Division: Table 11. This division contains those employees least likely to be directly affected by the major technological changes under consideration, data processing by computer excepted. At the same time, we must observe that modern technology tends, as a rule, to require more administration and higher level technical expertise than was required in the past, and there is some evidence of this in the employment changes in this division.

^{1/} These two sets of data are: firstly, the monthly employment information arranged according to the 84 occupational groupings of the official reports submitted by the railways to DBS and the Board of Transport Commissioners; and, secondly, the detailed occupational breakdown of employment for September 1948 and September 1960, according to 906 titles for railway and express occupations.

Table 11
Reporting Division: 'General'. Changes in Occupational Composition 1948-1960

| Occupational Group No. | Actual Numbers in 1948 | 1 | 2 | 3 | 4 | 5 | 6 | Employment Level Changes 1948-1958 |
|---------------------------------------|------------------------|------|------|------|------------|------------------|------------------|---|
| | | | | | | | | Relative to Total Employment in CNR Maritimes |
| 1 | 117 | +25 | +54 | +56 | +1.3 | increase | increased more | |
| 2 | 87 | + 8 | +17 | +43 | +22.2 | increase | increased more | |
| 3 | 58 | + 2 | +55 | +47 | - 5.2 | increase | increased more | |
| 4 | 1,285 | + 9 | +14 | +11 | - 2.6 | increase | increased more | |
| 5 | 152 | + 4 | -60 | -61 | - 2.5 | greater decrease | decreased | |
| 6 | 70 | +26 | +14 | +29 | +13.2 | increase | increased more | |
| 7 | 95 | -72 | -84 | -86 | -12.5 | greater increase | decreased | |
| 8 | 5 | (4) | (6) | (5) | (increase) | (increased more) | (increased more) | |
| 9 | 8 | (11) | (16) | (15) | (increase) | (increased more) | increased more | |
| 10 | 86 | +13 | +27 | +2 | -19.7 | increase | (increased more) | |
| 11 | 7 | (8) | (12) | (13) | (increase) | (increased more) | (increased more) | |
| 12 | 205 | - 4 | +21 | +18 | - 2.5 | increase | increased more | |
| Total 'General' Reporting Division... | 2,179 | + 4 | +10 | + 7 | - 2.7 | increase | - | |
| Total Groups No. 1 - No. 79..... | 15,735 | ¶ | -12 | -16 | - 4.6 | - | - | |

Numbers in brackets denote absolute numbers rather than percentage changes, as base is very small.

¶ No change.

The division as a whole increased its employment moderately between 1948 and 1958 (as against a declining trend in employment for the Maritime area as a whole) and between 1958 and 1960 declined somewhat less than total employment.

The expanding occupational groups of really major significance are in the executive, professional and clerical classifications. All of these groups may have been affected, not only by technological changes, but also by a policy of decentralization of administrative function.^{2/} Thus, to some extent, employment gains in the Maritimes may have been offset by losses in Montreal. The expansion of the executive group was fairly steady throughout the entire period, while the professional group picked momentum during the later period. The clerical group is by far the largest in the division, and showed moderate percentage increases to 1958, with a subsequent slight decline. There were rather erratic shifts in the number of storemen and stores labourers, a large percentage increase having occurred between 1954 and 1958.

2. The 'Ways and Structures' Division: Table 12. This division has declined quite markedly since 1954. The decline reflects the increased use of heavy construction equipment (see Occupation 21: Work Equipment Operators and Helpers), the lower maintenance requirements of improved roadbeds, and the use of more mobile maintenance gangs.

The sharpest declines, affecting the largest number of workers, have been among extra-gang labourers and sectionmen.^{3/} The extra-gang labourers work at special and seasonal jobs, such as ditching, grading, laying of track and snow removal, and their decline reflects both the increased use of heavy equipment and improved condition of roadbeds. The sectionmen have been affected by similar improvements, as well as by more automatic signalling and switching apparatus. There has been an increase in most types of supervisory personnel (on a rather small base) except for section foremen, and an increase in heavy equipment operators since 1954. The relatively small number of workers concerned with the maintenance of signals increased considerably after 1954.

Most of the major changes in this division occurred after 1954. Some of the trends (as in the case of work equipment operators and of sectionmen and foremen) were reversed or moderated during the period 1958 to 1960.

3. The 'Equipment' Division: Table 13. This division underwent a decline in employment of 37 per cent over the entire period, which is the largest percentage decline exhibited by any of the five reporting divisions. This decline was much greater proportionally than that of CNR Maritime area employment as a whole, and was spread fairly evenly over the entire time span and over the various occupations making up the division.

The trend appears to be related primarily to dieselization and also to improved shop methods. A shift in the company's make-or-buy policy may also have been a factor in declining employment.

^{2/} There may also have been a certain amount of upgrading of job titles.

^{3/} The majority of occupations in this division have actually increased their numbers over the period under review. These two occupations (which are the two largest in the division) have set the downward pattern for the division as a whole.

Table 12

Reporting Division: 'Ways and Structures'. Changes in Occupational Composition 1948-1960

| Occupational Group No. | 1 Actual Numbers in 1948 | 2 Per Cent Change 1948-1954 | 3 Per Cent Change 1948-1958 | 4 Per Cent Change 1948-1960 | 5 Per Cent Change 1958-1960 | Employment Level Changes 1948-1958 | | 7 Relative to Reporting Div. |
|------------------------|--|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--|--------------------------|------------------------------------|
| | | | | | | 6 Relative to Total Employment in CNR Maritimes | 7 | |
| 13 | B. & B. Masters, Roadmasters and Assistants... | 32 | +153 | +144 | +162 | + 7.4 | increase (increase) | increase (increase) |
| 14 | Maintenance of Way and Scale Inspectors..... | 6 | (5) | (10) | (10) | + 1.9 | increase | increase |
| 15 | B. & B. Department Foremen..... | 52 | + 4 | + 8 | + 7 | +10.2 | increase | increase |
| 16 | B. & B. Carpenters and Bridgemen..... | 228 | + 8 | + 5 | + 7 | + 1.9 | increase | increase |
| 17 | Blacksmiths, Pipefitters and Tinsmiths..... | 6 | (8) | (18) | (19) | (increase) | (increase) | (increase) |
| 18 | Masons, Painters and Other Journeymen..... | 86 | - 20 | - 10 | + 26 | +40.0 | smaller decrease | smaller decrease |
| 19 | Helper, B. & B. Department..... | 28 | - 46 | - 32 | + 7 | +57.4 | greater decline | greater decline |
| 20 | Labourer, Bridge, Building and Signal..... | 152 | + 20 | - 9 | - 35 | -28.6 | smaller decrease | smaller decrease |
| 21 | Work Equipment Operators and Helpers..... | 71 | - 6 | +158 | + 87 | -27.5 | increase | increase |
| 22 | Pumpmen..... | 18 | (8) | (-) | (-) | (greater decline) | (greater decline) | (greater decline) |
| 23 | Extra-Gang and Snow-Plow Foremen..... | 50 | + 4 | + 14 | - 36 | -43.9 | increase | increase |
| 24 | Section Foremen..... | 360 | + 1 | + 1 | - 10 | -10.9 | increase | increase |
| 25 | Labourers, Extra-Gang..... | 1,222 | + 2 | - 27 | - 43 | -21.9 | greater decline | greater decline |
| 26 | Sectionmen..... | 1,718 | - 17 | - 36 | - 37 | - 1.6 | greater decline | greater decline |
| 27 | Gen. and Asst. Gen. Foremen and Insp.-Signal and Electrical Transmission..... | 5 | { 6 } (1) | { 7 } (4) | { 11 } (9) | (increase) (increase) | (increase) (increase) | (increase) |
| 28 | Foremen-Signal and Electrical Transmission and Signal and Interlocker Maintainers and Helpers..... | 2 | + 6 | + 75 | +230 | +88.6 | increase | increase |
| 29 | Linemen and Groundmen - Electrical Transmission..... | 48 | - | - | - | - | - | - |
| 30 | Total 'Ways and Structures' Reporting Division..... | 4,488 | - 1 | - 17 | - 26 | -10.8 | greater decline | - |
| | Total Groups No. 1 - No. 79..... | 15,735 | * | - 12 | - 16 | - 4.6 | - | - |

Numbers in brackets denote absolute numbers rather than percentage changes, as base is very small.

* No change.

Table 13

Reporting Division: 'Equipment'. Changes in Occupational Composition 1948-1958

| Occupational Group No. | Reporting Division | Employment Level Changes 1948-1958 | | | | | |
|------------------------|--|------------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--|
| | | 1 Actual Numbers in 1948 | 2 Per Cent Change 1948-1954 | 3 Per Cent Change 1948-1958 | 4 Per Cent Change 1948-1958 | 5 Per Cent Change 1958-1960 | 6 Relative to Total Employment in CNR Maritimes |
| 31 | General Foremen, Foremen and Assistant Foremen..... | 238 | +19 | +4 | +7 | +2.9 | increase |
| 32 | Blacksmiths..... | 74 | -20 | -46 | -51 | -9.3 | greater decline |
| 33 | Boilermakers..... | 184 | -40 | -68 | -66 | +6.3 | greater decline |
| 34 | Carmen, Coach and Locomotive..... | 224 | -7 | -21 | -31 | -12.7 | smaller decline |
| 35 | Carmen, Freight..... | 497 | +15 | -1 | +4 | +5.1 | smaller decline |
| 36 | Electrical Workers..... | 114 | +28 | +87 | +68 | -10.2 | increase |
| 37 | Machinists..... | 564 | -25 | -30 | -42 | -17.1 | same decline (greater decrease) |
| 38 | Moulders..... | 9 | (8) | (6) | (7) | -3.1 | greater decline |
| 39 | Pipefitters and Sheet-Metal Workers..... | 116 | -6 | -2 | -5 | -28.6 | smaller decline |
| 40 | Helpers to Mechanics..... | 851 | -27 | -58 | -70 | -23.1 | greater decline |
| 41 | Apprentices..... | 172 | +27 | -22 | -40 | -14.9 | smaller decline |
| 42 | Coach Cleaners..... | 187 | +5 | -6 | -20 | -14.9 | greater decline |
| 43 | Classified Labourers (Shops, Enginehouses and Power Plants)..... | 632 | -10 | -53 | -60 | -14.9 | greater decline |
| 44 | Unclassified Labourers (Shops, Enginehouses and Power Plants)..... | 169 | -38 | -38 | -37 | +1.6 | greater decline |
| 45 | Stationary Engineers, Firemen and Oilers..... | 75 | -13 | -25 | -56 | -41.3 | smaller decline |
| | Total 'Equipment' Reporting Division. | 4,111 | -11 | -30 | -37 | -10.0 | greater decrease |
| | Total Groups No. 1 - No. 79..... | 15,735 | ▲ | -12 | -16 | -4.6 | - |

Numbers in brackets denote absolute numbers rather than percentage changes, as base is very small.

▲ No change.

There were sharp declines in all of the metalworking trades associated with the building and repair of steam locomotives.^{4/} At the same time, employment of electrical workers increased rather sharply, more electrical maintenance being required for diesels than for steam locomotives. There is also, in this division, the same decline in labourers and other unskilled workers observable generally throughout the system.

4. The 'Transportation' Division (non-train): Table 14. This division increased in size between 1948 and 1954, declining moderately thereafter. Within the division, the occupational trends show the effects of fewer and bigger trains, as well as of a certain amount of scaling down of passenger services. This division displays a reversal of the pattern in other divisions, in that supervisory personnel have tended to decline slightly in number, while certain types of unskilled employment have tended to increase.

The slight decrease in train dispatchers reflects the more efficient dispatching methods inherent in centralized traffic control, while the decline in all types of sleeping and dining car^{5/} personnel was due to the elimination of many of these services because they had proved unprofitable. The largest numerical increases in this division have been among freight handlers, while a very high percentage increase is shown for baggage, parcel room, and station attendants. Small stations and their personnel appear to have been virtually eliminated during the twelve years under review.

With respect to timing, the decline in the various types of dining and sleeping car personnel was fairly evenly divided over the entire period, although the major decline in conductors occurred prior to 1954, whereas the decline in porters occurred subsequently. The growth in numbers of station attendants, as well as the decline in small station personnel occurred mainly after 1954. The increase in labourers was not a steady trend: their employment was up sharply in 1954 over 1948, it had declined considerably by 1958, and increased somewhat between 1958 and 1960.

5. The 'Transportation' Division (train): Table 15. The effects of dieselizeation are no more apparent than in this division, which declined by almost one-quarter over the twelve-year period. The declines were, in almost all cases, fairly evenly distributed through the time period. It is interesting to note that the employment of firemen declined less than that of engineers, both numerically and in percentage terms. This suggests that the firemen have been successful in protecting themselves against the consequences of the redundancy of their occupation, although they, along with engineers and brakemen, have been affected by a lower over-all requirement for train crews. There were moderate increases in the employment of yard workers. In this connection it must be noted that, during the time span of the study, the Moncton hump yard had not yet begun to operate.

^{4/} Major diesel repairs tend to be assembly-type operations, and, during the period of the study, the diesels were new enough to not require any great amount of even this type of maintenance.

^{5/} This was true for the periods studied. The trends affecting passenger traffic and dining car personnel have now been reversed.

Table 14

Reporting Division: 'Transportation, Non-Train'. Changes in Occupational Composition 1948-1960

| Occupational Group No. | | 1 Actual Numbers in 1948 | 2 Per Cent Change 1948-1954 | 3 Per Cent Change 1948-1958 | 4 Per Cent Change 1948-1960 | 5 Per Cent Change 1958-1960 | Employment Level Changes 1948-1958 | | |
|------------------------|--|-----------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--|----------------------------------|----------------------------|
| | | | | | | | 6 Relative to Total Employment in CIN Maritimes | 7 Relative to Reporting Div.* | |
| 46 | Chief Train Dispatchers..... | 16 | -19 | -19 | -25 | -7.4 | decreased more | decreased | decreased |
| 47 | Train Dispatcher..... | 51 | +8 | -2 | -2 | -2 | decreased | decreased | decreased |
| 48 | Supervisory Agents and Assistants..... | 78 | -1 | +5 | +5 | +5 | increased less | increased less | increased less |
| 49 | Agents and Caretaker Agents at Small Stations (non-Telegraphers)..... | 30 | -30 | -94 | -97 | -50.0 | decreased | decreased | decreased |
| 50-51 | Station Agents, Telegraphers and Telephoners (non-Telegraphers) at Interlockers..... | 575 | +12 | +7 | +7 | +7 | increased | increased less | increased less |
| 52 | Levermen (non-Telegraphers) at Interlockers..... | 31 | +13 | +178 | +181 | +1.1 | increased more | increased more | increased more |
| 53 | Baggage, Parcel Room and Station Attendants..... | 165 | +7 | -38 | -42 | -6.5 | decreased | decreased | decreased |
| 54 | General Foremen and Foremen in Freight Sheds..... | 476 | +78 | +68 | +82 | +8.3 | increased more | increased more | increased more |
| 55 | Freight Handlers and Freight Shed Operators..... | 148 | +72 | +27 | +47 | +15.7 | increased (decreased) | increased (decreased) | increased (decreased) |
| 56 | Labourers..... | 15 | (16) | (11) | (8) | | | | |
| 57-58 | Dining Car Stewards, Chefs, Cooks and Waiters (decreased) | 330 | -20 | -37 | -47 | -15.9 | decreased more | decreased | decreased |
| 59 | Restaurant Managers, Chefs, Cooks and Waiters (decreased) | - | - | - | - | - | - | - | - |
| 60 | News Agents..... | 29 | -45 | -59 | -62 | -7.3 | decreased more | decreased | decreased |
| 61 | Sleeping and Parlour Car Conductors..... | 131 | 4 | -24 | -36 | -15.8 | decreased more (increased) | decreased more (increased) | decreased more (increased) |
| 62 | Porters and Other Train Attendants..... | 4 | (4) | (8) | (9) | | | | |
| 63 | Bridge Operators..... | 37 | +16 | +13 | +11 | -1.8 | increased same | increased same | increased same |
| 64 | Crossing Watchmen and Gatemen..... | 273 | +26 | +32 | +13 | -14.4 | increased more | decreased | decreased |
| 65 | Floating Equipment Employees..... | 62 | 40 | +23 | +13 | +7.1 | decreased more | decreased more | decreased more |
| 66 | Yardmasters and Assistants..... | 40 | -20 | -12 | -40 | -31.8 | increased same | increased same | increased same |
| 67 | Switch Tenders..... | 60 | | | | | | | |
| | Total 'Transportation, Non-Train' Reporting Division..... | 2,379 | +21 | +13 | +11 | -1.8 | increased | - | - |
| | Total Groups No. 1 - No. 79..... | 15,735 | 4 | -12 | -16 | -4.6 | - | - | - |

Numbers in brackets denote absolute numbers rather than percentage changes, as base is very small.

* No change.

Table 15

Reporting Division: 'Transportation, Train'. Changes in Occupational Composition 1948-1960

| Occupational Group No. | 1 Actual Numbers in 1948 | 2 Per Cent Change 1948-1954 | 3 Per Cent Change 1948-1958 | 4 Per Cent Change 1948-1960 | Employment Level Changes 1948-1958 | |
|------------------------|---|--------------------------------|--------------------------------|--------------------------------|------------------------------------|--|
| | | | | | 5 Per Cent Change 1958-1960 | 6 Relative to Total Employment in CNR Maritimes |
| 68 | Road Passenger Conductors..... | 59 | -12 | -27 | -10 | +23.3 |
| 69 | Road Freight Conductors..... | 249 | -28 | -23 | -10 | +16.9 |
| 70 | Road Passenger Brakemen and Baggagemen..... | 130 | -6 | -31 | -12 | +27.5 |
| 71 | Road Freight Brakemen..... | 600 | -10 | -25 | -25 | declined more |
| 72 | Road Foremen..... | 136 | +21 | + 2 | +13 | increased |
| 73 | Yard Helpers..... | 284 | +26 | + 8 | +12 | increased |
| 74 | Road Passenger Engineers and Motormen..... | 83 | -10 | -27 | -34 | declined more |
| 75 | Road Freight Engineers and Motormen..... | 348 | -29 | -49 | -50 | declined more |
| 76 | Yard Engineers and Motormen..... | 138 | + 1 | +20 | -17 | declined less |
| 77 | Road Passenger Firemen and Helpers..... | 78 | -13 | -27 | -42 | declined more |
| 78 | Road Freight Firemen and Helpers..... | 418 | -27 | -36 | -43 | declined more |
| 79 | Yard Firemen and Helpers..... | 143 | - 4 | +10 | +10 | increased |
| | Total 'Transportation, Train' Reporting Division..... | 2,845 | -12 | -23 | -24 | -1.3 |
| | Total Groups No. 1 - No. 79..... | 15,735 | * | -12 | -16 | -4.6 |

Numbers in brackets denote absolute numbers rather than percentage changes, as base is very small.

* No change.

Regarding the period 1958 to 1960, it should be noted that this reporting division is mainly composed of operating employees, for whom the correlation of volume of traffic and employment levels should, on the face of it, be very strong. It is therefore somewhat surprising that over-all employment in this division continued to decline. It should be noted though that the decreases in employment occurred in only four of the twelve component occupations of the division, with firemen being particularly hard hit.

Some Conclusions. It should be useful at this point, before developing alternative occupational information, to briefly summarize our findings. Because of the detailed nature of the information, only the most important changes can be indicated here, and even these must be confined to a generalized statement without details or qualifications.

One of the most important generalizations that can be made is that whatever changes in employment levels occurred, the greater proportion of them tended to occur in the period 1955 to 1960. This gives some indication of the way in which the employment effects of technological change have gathered momentum during this period, a conclusion that is borne out by the fact that employment levels in an overwhelming majority of the occupational groups declined in the period 1958 to 1960, at the very time when output rose on the order of 15 per cent.

Another rather significant observation concerns the great group-to-group differences in employment changes within each reporting division. This shows that the over-all change in employment in a division is often not helpful for the purpose of analyzing changing occupational structure. For instance, sharp declines in a few groups within the 'Ways and Structures' reporting division completely conceal the fact that most occupational groups in the division show increased employment over the reference period.

The Detailed Occupational Breakdown

The second approach to the analysis of changing occupational structure of employment in the CNR Maritime area is made on the basis of an extremely detailed occupational breakdown, which was described in the previous chapter. Obviously, such a fine classification of jobs is not directly suitable for occupational analysis. However, it does provide opportunities for grouping the data in various ways that would be impossible using the more heterogeneous occupational groups contained in the Monthly Compensation Reports. Needless to say, such groupings tend to be highly subjective. The important thing, nevertheless, is not whether a given occupation is classified into one group or another, but rather whether it is classified consistently for the two time periods.

Hotels, ferry services, and communications have been completely or partly excluded from this analysis. The occupations shown in Table 16 (p. 62) are divided into 24 broad groupings containing 182 occupations. These include, in addition to the railroad occupations, cartage, highway services, and express occupations. Of these, one broad grouping, including 11 occupations, covers the express department. Table 17 presents a separate but similar breakdown for the communications department.

If we first consider the broader occupational groupings, it is evident that 15 of the 24 have expanded their employment over the period 1948 to 1960. Those showing a declining level of employment are: 'clerical occupations exclusive of office machine operators', 'apprentices', 'occupations connected with on-train operations', 'freight shed occupations', 'foremen and assistant foremen', 'skilled tradesmen', 'helpers to skilled tradesmen', and 'unskilled labourers'. In general

terms, the decline in the employment of clerks is due to the increased degree of mechanization of office tasks. The decline in employment of apprentices, skilled tradesmen, and their helpers can be largely attributed to the use of better equipment of all types, of new materials, and of new techniques in equipment maintenance and repair. The sharp decline in employment levels for occupations connected with on-train operations is mainly due to the changing pattern of traffic. More specifically, this employment decline is associated with the diminished importance of passenger traffic, an operational area that is more labour intensive than freight traffic operations. A subsidiary cause of the same decline was identified in more efficient dispatching, routing, and traffic control. The reduction in freight shed jobs is primarily due to the use of loading machinery, and to some extent to the use of 'trailers-on-flat-car' or 'piggy-back' traffic. While 'foremen and assistant foremen' experienced a small decline in employment, this was almost entirely due to a decline in the employment of section foremen, extra-gang foremen, and foremen of ancillary services such as junkyard, fuel plant, etc. However, all other categories of foremen registered gains in employment. The last broad group - unskilled labourers - also experienced a decline in employment opportunities. This, of course, is not surprising. While they still account for a sizable proportion of total employment in the railroad, the demand for their services in all functional areas has been diminishing since 1948.

Among the broad occupational groups which show expanded employment over the twelve-year period, there are many differences in the degree of expansion. The greatest expansion (in terms of percentage change, although this is actually a small group) occurred among equipment operators which, in this particular instance, means operators of heavy equipment such as steam shovels, bulldozers, front-end loaders, electric cranes, etc. The other four groups which more than doubled their employment levels are the professional occupations, various types of instructors, yard supervisory occupations, and machine operators. The last type includes all kinds of machine operators except for operators of office machines and of heavy equipment.

Employment in the express department rose over the period from 575 to 727, a gain of roughly 27 per cent, while employment in the communications department rose very slightly from 387 to 394.

In what follows the changes from 1948 to 1960 in employment levels for any occupational group will be classified into one of the following categories:

- 1) employment more than doubled;
- 2) employment increased less than 100 per cent, but more than 15 per cent;
- 3) employment increased, but less than 15 per cent;
- 4) employment decreased by up to 49 per cent;
- 5) employment decreased by 50 per cent or more.

The criteria chosen are, for the most part, arbitrary. The 15 per cent criterion used in groups Nos. 2 and 3 represents the approximate increase in traffic volume in 1960 relative to 1948. This separates those groups which have increased proportionately more or proportionately less than physical output over the period, but did not exceed the 100 per cent increase in employment levels.

We must still add two further categories:

- 6) employment remained steady; and
- 7) employment in 1948 was nil.

This last category reveals a difficulty that was encountered due to changing personnel practices. Some of the existing positions were non-existent in 1948 and are, of course, merely changes in job titles. These changes are in keeping with the widespread tendency in the economy to upgrade jobs by assigning new titles. To some extent, this group is accounted for by the fact that, in the interest of more efficient operation and concurrently with changing technology, new positions were established as time went by. It seems reasonable from the analysis of category 7) that the new positions established in the supervisory categories reflect, for the most part, job title upgrading and, to a lesser extent, the establishment of bona fide new positions. Among the non-supervisory job groups, however, there is little evidence to indicate that purely formal job title upgradings have been a factor to any large extent. We must conclude, therefore, that most of the job groups in which employment was zero in 1948 do constitute a reflection of changing technology.

The 171 job groups are distributed through the seven categories as follows:

- 1) employment levels more than doubled, 31 groups or 18 per cent of all groups;
- 2) employment increased more than 15 per cent but less than 100 per cent, 24 groups or 14 per cent of all groups;
- 3) employment levels increased less than 15 per cent, 13 groups or approximately 7 1/2 per cent of all groups;
- 4) employment levels decreased up to 49 per cent, 47 groups or about 27 1/2 per cent of all groups;
- 5) employment levels decreased by over 50 per cent, 19 groups or 11 per cent of all groups;
- 6) no change in employment level occurred in 9 groups, or approximately 5 1/2 per cent of all of the groups; while
- 7) those occupational groups which did not exist in 1948 number 28, accounting for 16.5 per cent of the groups existing in 1960.

Of particular interest in connection with the impact of technological changes on employment are the new occupations which have emerged during the period under review. Table 16 shows that these are as follows: superintendent or manager staff department or division, professional occupations other than engineering, assistance to management and to professionals on the subprofessional level, technical assistance not specified, statistical technicians, inspectors of working conditions, checkers of materials, management skill instructors, supervisors of training programs, yard signals and similar operations instructors, driving instructors, chief clerks-machine operators, clerks-machine operators, sales trainees, student engineers, student telegraphers, supervisory agents, motor mechanics, machinists with subspecialty - excluding welding, helpers on road maintenance machines, helpers to operators' extra-gang,

locomotive testers' helpers, yard office supervisors, diesel engineers in ways and structures, small power tool operators, and front-end loader operators.

Of all of the employment groupings, those at the two extremes may be of special interest, i.e., categories 1) and 5). The groups in which employment levels have increased by more than 100 per cent from 1948 to 1960 are as follows: engineers designated by functional areas, assistant engineers designated by functional areas, sales representatives, inspectors of efficiency, engineering and technical instructors, crew dispatchers and routing aides, operators of communication equipment, buyers and assistant buyers, electrical workers, trainmasters, baggagemen, coopers, loading equipment operators, mechanical maintenance repairmen, signal maintainers, roadmasters and assistant roadmasters, gardeners and other non-railroad crafts, cranemen's helpers, production machine operators' helpers, signalmen's helpers, yardmasters and general yardmasters, electric crane operators, crane operators, tractor operators, steam hoist operators, bulldozer operators, track maintenance machinery operators, bricklayers and masons, to operators' extra-gang, acetylene burner operators, and grinder and wheel press operators.

The groups with the greatest reductions in employment level are as follows: inspectors and investigators of claims, typists, comptometer and other office machine operators, machinists, apprentices in shop crafts (other than carmen, machinists, and electrical workers), waiters and stewards, chefs, car service operators, shedmen (stores) and freight loaders, boilermakers, welders' helpers, machinists' helpers, blacksmiths' and hammersmiths' helpers, boilermakers' helpers, pipefitters' and plumbers' helpers, sheet-metal workers' helpers, painters' helpers, welding machine operators, and labourers' extra-gang.

The rest of the occupational groups fall between these extremes. It is interesting to note that practically no group of tradesmen adversely affected by technological change appears in the list of those groups with the most drastic reductions in employment. On the other hand, a great number of helpers in various crafts do show up among the occupational groups most heavily affected. This contrast is indicative of the fact that adjustment processes are modified to a considerable extent by the seniority provisions of the collective agreements, and the various time lags involved in the introduction of new techniques and new equipment. The effects of technological changes often get transmitted to groups other than those primarily affected. In this particular case the reduced demand for diverse crafts was transmitted to the helpers and apprentices. To adequately evaluate the full effects of technological changes, it is often necessary to look for such diffusion of effects.

Another source of difficulty in assessing the full effects of technological change is the well-known tendency for some individuals or individual crafts to change their actual work while retaining or slightly altering their job titles. For example, some carmen, machinists, and boilermakers who specialized in welding are now called carmen-welders, machinist-welders and boilermaker-welders. Again, the so-called mechanical maintenance repairmen may have come from a number of crafts. Another instance of such a change in job title is the sharp decline of freight loaders, shedmen, stores and freight boarders, vis-a-vis the rather significant increase in the number of loading equipment operators in the sheds. It seems reasonable to assume that most of the people previously in the former occupations have been trained to operate freight loading equipment. To be sure, this latter occupation is slightly more skilled and, because of this, it represents both an upgrading of the job structure and an upgrading of the man employed.

The evaluation of changes in employment levels of occupational groups in express and communications will be somewhat different, due to the fact that our output measures do not relate directly to employment in these areas. With respect to the express operations, i.e., the 24th broad occupational group in Table 16, the following changes seem to be of relatively greatest significance:

- 1) a slight increase in the employment of clerks, a trend opposite to that found in the railroad;
- 2) a large increase in foremen and assistant foremen which, of course, is in line with the prevailing trend; and
- 3) a reduction in messengers which, in the face of seemingly increased volume of output, may reflect better communication techniques.

Depending on what happened to output (no data are available beyond the fact that there was a significant increase in volume), the increase in the number of scalemen and motormen may tend to reflect the increasing emphasis that the railway places on the expansion of express services, and the increase in public demand for speedier transportation services.

Table 17 sets out a fairly crude grouping of occupations in the communications department, together with changes over the period 1948 to 1960. As no detailed analysis has been attempted concerning the changing technology involved in the operations of the communications department, the Table is presented without further comment. The reader will no doubt be able to identify some of the trends already indicated in connection with the railway operations.

In summary, the diversity of changes in employment levels must again be emphasized. Changes ranged from increases of over 100 per cent to reductions to zero. By and large, it is evident that the majority of expanding occupations are in the technical white-collar field, in the various groups concerned with operating and maintaining various mechanical devices and equipment, and in supervisory positions of various kinds. The greatest reductions in employment levels were experienced by unskilled labour of various types, office machine operators other than those connected with EDP, and various apprentices and helpers to craftsmen. With some minor differences, these generalizations largely support the conclusions one can draw from the occupational changes shown in the Monthly Compensation Reports discussed in section (a) of this chapter.

Table 16

Occupational Breakdown of Employment in the Maritime Area
of the CNR 2nd Pay Period September 1948 and 1960

(excludes ferry services, hotel services and the communications department)

| | 1948 | 1960 | |
|--|------|------|--|
| Department Heads and Asst. Dept. Heads Total.. | 42 | 71 | |
| Superintendent or Manager of Operational Div. or Dept. | 31 | 43 | |
| Superintendent or Manager of Staff Dept. or Div. | - | 11 | |
| Administrator of a Staff Function.... | 11 | 17 | |
| Professional Occupations..... | 33 | 70 | |
| Construction Engineer and Architect..... | 9 | 8 | |
| Division and District Engineer..... | 6 | 6 | |
| Electrical Engineer (all grades)..... | 3 | 4 | |
| Engineer Designated by Functional Area.... | 3 | 9 | |
| Professional Occupation Other Than Engineer..... | - | 6 | |
| Asst. Engineer Designated by Functional Area..... | 7 | 34 | |
| Mechanical Engineer (all grades)..... | 5 | 3 | |
| Subprofessional Occupations..... | 64 | 104 | |
| Assistant to Management..... | - | 4 | |
| Assistant to Professional..... | - | 19 | |
| Technical Assistant Not Specified..... | - | 2 | |
| Instrumentman and Rodman..... | 50 | 52 | |
| Draughtsman (all grades)..... | 14 | 21 | |
| Statistical Technician..... | - | 6 | |
| Sales Occupations..... | 33 | 36 | |
| Travelling, City and General Agent..... | 12 | 15 | |
| Sales Representative..... | 3 | 6 | |
| Ticket Agent..... | 18 | 15 | |
| Occupation With Control Functions..... | 170 | 227 | |
| Inspector of Technical Standards..... | 31 | 56 | |
| Inspector of Standards of Competence..... | 12 | 16 | |
| Inspector and Investigator of Claims..... | 2 | 1 | |
| Inspector of Efficiency..... | 21 | 44 | |
| Inspector of Working Conditions..... | - | 1 | |
| Police and Security Agent..... | 104 | 101 | |
| Checker of Materials..... | - | 2 | |
| Instructors..... | 7 | 14 | |
| Engineering and Technical..... | 1 | 4 | |
| Management Skills..... | - | 1 | |
| Supervisor of Trainee Programs..... | - | 4 | |
| Supervisor of Yard, Signal and Similar Operations..... | - | 1 | |
| Apprentice Instructor..... | 2 | 2 | |
| Instructor- Porter..... | 1 | 1 | |
| Driving Instructor..... | - | 1 | |
| Clerical Occupation Exclusive of Office | | | |
| Machine Operators..... | 832 | 749 | |
| Chief Clerk and Asst. Chief Clerk..... | 58 | 45 | |
| Senior Clerk..... | 31 | 27 | |
| Clerk..... | 623 | 553 | |

Table 16 (Cont'd)

| | 1948 | 1960 |
|---|-------|-------|
| Clerical Occupation Exclusive of Office | | |
| Machine Operators (Cont'd) | | |
| Asst. Clerk..... | 17 | 19 |
| Junior Clerk..... | 19 | 21 |
| Clerk With Specialized Function..... | 65 | 81 |
| Typist..... | 19 | 3 |
| Office Occupations (Excluding Clerks)..... | 470 | 530 |
| Claims Agent..... | 14 | 10 |
| Chief Clerk - Machine Operator..... | - | 1 |
| Machine Biller (all grades)..... | 18 | 18 |
| Machine Operator Clerk..... | - | 71 |
| Crew Dispatcher and Routing Aide..... | 8 | 16 |
| Comptometer and Other Office Machine Operator..... | 40 | 16 |
| Operator of Communication Equipment..... | 22 | 44 |
| Stenographer and Secretary..... | 213 | 198 |
| Buyer and Asst. Buyer..... | 2 | 5 |
| Call Boy, Messenger - Office Boy..... | 133 | 135 |
| Accountant and Asst. Accountant..... | 20 | 16 |
| Student and Trainees..... | 32 | 59 |
| Sales Trainee..... | - | 1 |
| Student Engineer..... | - | 15 |
| Dispatcher Student..... | 32 | 37 |
| Student Telegrapher..... | - | 6 |
| Apprentices..... | 150 | 100 |
| Carman..... | 53 | 34 |
| Electrical Worker..... | 7 | 35 |
| Machinist..... | 68 | 20 |
| Other Shop Craft..... | 22 | 11 |
| Occupation Connected With On-train | | |
| Operations..... | 2,819 | 2,053 |
| Trainmaster..... | 2 | 7 |
| Train Dispatcher..... | 72 | 63 |
| Waiter and Steward..... | 151 | 63 |
| Chef..... | 28 | 9 |
| Cook and Pantryman..... | 191 | 160 |
| Road Brakeman and Baggage-man..... | 777 | 619 |
| Fireman..... | 636 | 418 |
| Engineer..... | 560 | 384 |
| Conductor..... | 271 | 241 |
| Porter..... | 131 | 89 |
| Station Personnel..... | 798 | 843 |
| Baggage Agent and Master..... | 51 | 39 |
| Freight and Cartage Agent and Asst. Agent..... | 29 | 39 |
| Supervisory Agent..... | - | 10 |
| Baggageman..... | 6 | 14 |
| Station and Depot Master, Assistant..... | 4 | 3 |
| Station Agent, Agent Operator, Ticket Seller..... | 306 | 319 |
| Car Service Operator..... | 5 | 2 |
| Morse Operator..... | 30 | 18 |
| Telegrapher..... | 272 | 313 |
| Ticket Examiner and Baggage Checker..... | 6 | 6 |
| Porter and Red Cap..... | 89 | 79 |

Table 16 (Cont'd)

| | 1948 | 1960 |
|--|-------|-------|
| Freight Shed Occupations..... | 345 | 253 |
| Freight Loader..... | 56 | 36 |
| Cooper..... | 1 | 3 |
| Loading Equipment Operator..... | 4 | 191 |
| Car Sealer..... | 1 | 1 |
| Shedman, Stower, Freight Porter..... | 283 | 22 |
| Foremen and Asst. Foremen..... | 872 | 843 |
| Foreman and Asst. Foreman M.P. and C.E..... | 155 | 186 |
| Foreman Ways and Structures Including Sections..... | 417 | 370 |
| Foreman and Asst. Foreman Extra-gang..... | 81 | 43 |
| Foreman Transportation..... | 169 | 212 |
| Foreman Ancillary Services..... | 45 | 26 |
| Foreman Cleaning, Scrap Yard, etc..... | 5 | 6 |
| Skilled Tradesmen Including Lead Hands..... | 2,163 | 1,846 |
| Electrical Maintainer..... | 11 | 13 |
| Diesel Maintainer..... | 5 | 3 |
| Cabinetmaker..... | 117 | 129 |
| Welder..... | 35 | 23 |
| Painter..... | 112 | 81 |
| Pipefitter, Plumber and Millwright..... | 107 | 92 |
| Mechanical Maintenance Repairman..... | 12 | 27 |
| Signal Maintainer..... | 31 | 66 |
| Machinist..... | 648 | 336 |
| Blacksmith..... | 64 | 37 |
| Electrical Worker..... | 87 | 160 |
| Master Mechanic..... | 6 | 4 |
| Boilermaker..... | 176 | 59 |
| Motor Mechanic..... | - | 5 |
| Locomotive Carpenter..... | 14 | 9 |
| Coach Carpenter..... | 135 | 79 |
| Carman, Machinist and Boilermaker Welder..... | 16 | 18 |
| Machinist With Subspecialty Excl. | | |
| Welding..... | - | 3 |
| Moulder..... | 12 | 7 |
| Sheet-metal Worker..... | 40 | 37 |
| Carman of Various Special Skills..... | 20 | 35 |
| Carman Without Special Skill Shown..... | 482 | 536 |
| Bridge and Building Master..... | 5 | 9 |
| Roadmaster and Asst. Roadmaster..... | 27 | 75 |
| Gardener and Other Non-R.R. Craft..... | 1 | 3 |
| Helpers..... | 967 | 439 |
| Craneman's Helper..... | 3 | 6 |
| Carpenter's Helper..... | 17 | 12 |
| Bricklayer's and Mason's Helper..... | 4 | 3 |
| Production Machine Operator's Helper..... | 2 | 5 |
| Welder's Helper..... | 13 | 6 |
| Helper on Road Maintenance Machines..... | - | 33 |
| Extra-gang Tool Operator's Helper..... | - | 18 |
| Signalman's Helper..... | 24 | 115 |
| Machinist's Helper..... | 329 | 40 |
| Blacksmith's and Hammersmith's Helper..... | 55 | 9 |
| Carman's Helper..... | 251 | 132 |
| Boilermaker's Helper..... | 157 | 8 |
| Pipefitter's and Plumber's Helper..... | 48 | 15 |

Table 16 (Cont'd)

| | 1948 | 1960 |
|--|--------|--------|
| Helpers (Cont'd) | | |
| Sheet-metal Worker's Helper..... | 9 | 2 |
| Electrical Worker's Helper..... | 28 | 29 |
| Locomotive Tester's Helper..... | - | 1 |
| Painter's Helper..... | 23 | 2 |
| Moulder's Helper..... | 4 | 3 |
| Yard Supervisory Occupations..... | 33 | 71 |
| Yardmaster, General Yardmaster..... | 9 | 52 |
| Yard Office Supervisor..... | - | 1 |
| Yard Agent..... | 24 | 18 |
| Yard Occupations..... | 568 | 674 |
| Car and Freight Checker..... | 195 | 206 |
| Hostler..... | 53 | 32 |
| Switch Tender..... | 43 | 44 |
| Yard Helper..... | 277 | 392 |
| Indirect Production Workers..... | 381 | 484 |
| Chauffeur, Motorman, Truck Driver..... | 108 | 168 |
| Elevator Operator..... | 3 | 4 |
| Store Occupation..... | 116 | 112 |
| Janitor, Watchman, Charwoman..... | 151 | 197 |
| Other Miscellaneous..... | 3 | 3 |
| Equipment Operators..... | 55 | 138 |
| Electric Crane Operator..... | 7 | 17 |
| Diesel Engineer (W and S)..... | - | 19 |
| Small Power Tool Operator..... | - | 1 |
| Crane Operator..... | 5 | 10 |
| Tractor Operator..... | 7 | 19 |
| Steam Shovel Operator..... | 3 | 2 |
| Steam Hoist Operator..... | 1 | 4 |
| Crawler Shovel Operator..... | 13 | 14 |
| Bulldozer Operator..... | 2 | 6 |
| Track Maintenance Machinery Operator..... | 15 | 40 |
| Welding Machinery Operator..... | 2 | 1 |
| Front-end Loader Operator..... | - | 5 |
| Specialized Occupations in Ways and Structures..... | 151 | 211 |
| Bridgeman..... | 23 | 34 |
| Rough Carpenter and Woodworker..... | 117 | 131 |
| Bricklayer and Mason..... | 10 | 30 |
| Tool Operator Extra-gang..... | 1 | 15 |
| Signalman..... | - | 1 |
| Machine Operators..... | 21 | 45 |
| Acetylene Burner Operator..... | 6 | 13 |
| Grinder and Wheel Press Operator..... | 1 | 11 |
| Shop Turntable Operator..... | 13 | 19 |
| Attendant, Refrigerator..... | 1 | 1 |
| Seamstress..... | 1 | 1 |
| Unskilled Labourers..... | 5,211 | 3,966 |
| With Special Job Title (ashman)..... | 250 | 188 |
| Without Special Job Title..... | 3,196 | 3,086 |
| Labourer's Extra-gang..... | 1,765 | 692 |
| Subtotal (Express Excluded)..... | 16,217 | 13,826 |

Table 16 (Concl'd)

| | 1948 | 1960 |
|----------------------------------|--------|--------|
| Total Express..... | 575 | 727 |
| Supervisor..... | 4 | 4 |
| Agent..... | 38 | 42 |
| Claims Agent..... | - | 1 |
| Chief and Asst. Chief Clerk..... | 3 | 2 |
| Stenographer..... | 19 | 17 |
| Clerk..... | 198 | 210 |
| Foreman and Asst. Foreman..... | 18 | 25 |
| Scaleman..... | 174 | 291 |
| Vehicle Helper..... | 6 | 7 |
| Motorman..... | 73 | 93 |
| Messenger..... | 42 | 35 |
| Total..... | 16,792 | 14,553 |

Table 17

The Communications Department CNR Maritime Area
Changing Occupational Structure 1948-1960

| | 1948 | 1960 | Per Cent Change 1948-1960 % |
|------------------------------|------|------|--------------------------------------|
| Operating Supervisors..... | 2 | 4 | +100 |
| Inspectors..... | 2 | 7 | +250 |
| Foremen..... | 5 | 5 | - |
| Instructors..... | 5 | 6 | + 20 |
| Agents, Asst. Agents..... | 2 | 9 | +350 |
| Draughtsmen..... | 1 | 1 | - |
| Office Occupations..... | 15 | 30 | +100 |
| Tradesmen or Equivalent..... | 24 | 74 | +208 |
| Gangmen..... | 197 | 136 | - 31 |
| Messengers..... | 101 | 88 | - 13 |
| Others Not Specified..... | 33 | 34 | + 3 |
| Total..... | 387 | 394 | + 2 |

Chapter 6

Technological Change and Career Patterns

As a prelude to the following analyses of technological change and career patterns it should be understood that it is probably impossible to disentangle and isolate the various effects of seniority structures from other inter-related factors. Consequently, this chapter should not be regarded as definitive.

One of the problems that commands a great deal of interest in studies of the manpower effects of technological change is the process of adjustment of individuals affected by the altered conditions. This problem is of central importance because judgment of the social value of more efficient operations depends predominantly upon the ease or difficulty with which the people who are affected find new places in the economy. In most studies concerned with technological change, attempts, both direct and indirect, have been made to ascertain the seriousness of the adjustment problems created both for the individual and for the society. The complexity of this subject often gives rise to great difficulties for the investigator. Generally speaking, it is not easy to trace the individual worker beyond the first or second change in his employment status, yet an adequate treatment of the problem necessitates information concerning both the final adjustment that is made, and the stages along the way towards the achievement of this adjustment. Information of this kind is best obtained through interviews, a costly and time-consuming process which tends to limit the scope of investigations.

What happens to an individual when manpower requirements change, either in terms of skill or location, is probably the combined result of numerous factors. Some of these, such as age, length of service, occupation, or the general level of economic activity can be isolated. Others, such as individual differences in outlook or the multitude of variations in local collective agreements are much more difficult to isolate. Thus, in the following analysis it is assumed that the most important determinants - those that can be isolated - are occupation, age, and length of service.^{1/} However, seniority provisions at the time were basically dissimilar for various employee groups and these

^{1/} In 1960 there were approximately 400 seniority groupings in the Maritimes for non-operating and operating employees alone. An example of such seniority provision is found in rules 28 and 39 of Wage Agreement No. 15 (between the Railway Association of Canada and Division No. 4, Railway Employees' Department AFL/CIO) covering shop crafts, which read as follows:

"Rule 28 - Employees who transfer from one point to another with a view to accepting a permanent transfer will, after 90 days, lose their seniority at the point they left and their seniority at the point to which transferred will begin on the date of transfer, seniority to govern; such transfer to be made without expense to the company. Employees will not be compelled to accept a permanent transfer to another point."

"Rule 39 - Seniority of employees in each craft covered by this agreement shall be confined to the point at which employed and to the date on which they enter classification, except as provided in Rule 28."

differences may have had a major influence on the phenomena discussed in this chapter. The definition of a seniority group is particularly pertinent to those covered by the shop craft 'point craft' arrangements and this includes 180 of the employees covered in this study who were originally located in the Truro Car Repair Shop and Roundhouse.

While this may be true in general, the variations in collective agreement provisions within the CNR are considerable and may have a differential impact on both the adjustment process and the final accommodation to changing production techniques. Quite apart from the differential impact, however, they certainly have great influence on the readjustment process in the railway industry, as contrasted to other industries. In order to demonstrate the special situation in the railway industry and perhaps to show in outline the intra-industry differences among the various groups of employees, a partial list of seniority provisions in abbreviated form is provided at the end of this chapter.

The general level of economic activity did not appear to have a decisive influence on the relative ease or difficulty of adjustment. There appears to have been enough employee turnover to provide opportunities for transfer into other jobs or other locations even in the face of stable or declining activity. Thus the influence of general economic activity shows itself only through the relative abundance or scarcity of job opportunities outside the railway industry. In the Maritime area, this factor was of little importance, since job opportunities outside the railway industry were relatively scarce throughout the period under review. Accordingly, the effect of fluctuating levels of general economic activity seems to influence the adjustment process only marginally, and it seemed reasonable to disregard it for purposes of this analysis.

Mobility Patterns in Four Establishments

This study is based on personnel records which supplies data on the career patterns of 488 individuals in some detail. The careers of these 488 persons were picked up at a point in time just prior to a change in production techniques in their particular establishments and were then followed until September 1961. No attempt has been made to trace the individual after he or she left the employ of the Canadian National Railways or transferred out of the region. As no well-established analytical framework for evaluating the data was available, various working concepts had to be created. These will be defined and explained as the analysis proceeds.

The employees whose career patterns are analyzed were all employed in one of four establishments, all four affected to a major degree by technological change. These establishments are:

- a) the Truro Roundhouse
- b) the Truro Car Repair Shop

- c) the New Glasgow Divisional Superintendent's Office; and
- d) the Moncton Yards.^{2/}

The job classification of each employee was determined for a time prior to the retrenchment that occurred in his particular establishment. Subsequent changes in his or her job title or location, as well as dates of layoffs and recalls were examined over the period ending September 1961.^{3/}

^{2/} The Moncton Yards were closed down in September 1960, and the operations of this establishment were transferred to a newly constructed modern hump yard. Both office employment and the engine and train crews working in the yard were affected by this move. The New Glasgow Divisional Superintendent's Office was discontinued as a result of the merging of the New Glasgow and Halifax subdivisions into the Scotia subdivision during 1957-1958. Considerable reductions in employment occurred at both the Truro Car Repair Shop and Roundhouse as maintenance work became concentrated in larger centres. As of this time of writing, employment in Truro has been reduced to a level consistent with its usefulness as a small shop for running repairs.

^{3/} To trace the effects of the dislocation on individual employees, it was decided to obtain a list of employees for the New Glasgow Divisional Superintendent's Office and for the Truro Car Repair Shop and Roundhouse as of October 1957. A similar list was also obtained for the employees of the Moncton Yard office and non-office employees as of April 1960. According to this information, there were, at these dates, 74 office employees in the Moncton Yard Office and 196 employees classified as engine and train crews; 38 employees in the New Glasgow Divisional Superintendent's Office; and 180 employees in the Truro Car Repair Shop and Roundhouse. Thus the Moncton Yard Office employment constitutes 15 per cent of our sample, the New Glasgow Divisional Superintendent's Office, 8 per cent. Therefore, 23 per cent of the sample are office employees while the remaining 77 per cent consists of non-office employees. This remaining 77 per cent is made up of 196 employees in the Moncton Yard, which accounts for 40 per cent of the sample, and 180 employees in the Truro Car Repair Shop and Roundhouse, accounting for the balance.

Among yard office employees in Moncton, there were 15 different occupations. Four of these: bill and train clerk, machine-operator clerk, call boy, and car checker make up 74.4 per cent of total employment. In the Moncton Yard there were 16 occupations for the train and engine crews, of which only five, trainman, conductor, brakeman, engineer, and fireman, accounted for over 90 per cent of total employment. In the Truro Car Repair Shop and Roundhouse, there were 35 separate occupations, of which the following 11 accounted for 86 per cent of all employment: carman, carman's helper, car cleaner, carman welder, foreman and assistant foreman, boilermaker's helper, boilermaker, machinist, machinist's helper, carman apprentice, ash-pitman, and firebuilder. In the New Glasgow Superintendent's Office, two groups of occupations, one of them 'clerk-typist/clerk-stenographer', and the other 'professional and engineering' accounted for 53 per cent of total employment. The other 47 per cent were distributed through 17 different occupations.

Table 18 will provide the bridge between two different approaches which were applied in analyzing the data. It summarizes the sample according to occupation and 'age-service groups'.^{4/}

It is interesting to note that over 67 per cent of the sample were 40 years of age or over, and that 90 per cent of these had at least 16 years of service. In occupations where one would normally expect younger people, such as call boy, carman apprentice, or stenographer, there are some younger people with relatively short service records. These, however, are the exceptions and, in some of the occupations such as carman's helper, machinist, or boilermaker, where at least some younger people might also be expected to be employed, Table 18 shows that this is not the case. This may be partly due to the general economic conditions in the Maritimes.

The scope of the study had to be seriously curtailed for the non-office employees of the Moncton Yard. The reason for this is that movement of these employees from assignment to assignment did not show up on staff record cards. Table 19 presents all the information that was available concerning these employees for the period April 1960 to September 1961. It is worth noting that only three of these 196 employees had resigned or been discharged, while 129 employees were still on the same assignment by the end of 17 months. Only two employees, both engineers, were forced to 'bump back' (as firemen), and only five layoffs occurred. On the other hand, total non-office employment for the Moncton Yard declined from 196 to 161, a reduction of close to 20 per cent, but apparently those displaced were able to be shifted to other assignments.

Our information is much more complete and detailed for the rest of the sample. Tables 20 and 21 show the characteristics of people who made a given number of 'moves'^{5/} in the period under review.

^{4/} There are 12 age-service groups. Each one constitutes a combination of the person's age and his length of service in the CNR. Group No. 1 designates those who were born prior to 1921 and entered CNR employment prior to 1945. Group No. 2 consists of those who were born before 1921 and entered CNR employment between 1945 and 1950. Group No. 3 consists of those who were born before 1921 and entered CNR employment between 1951 and 1956. The last group, No. 12, contains all those who were born in 1941 or later, and entered CNR employment after 1956. Correspondingly, all of the intermediate groups contain individuals who show particular combinations of age and length of service.

^{5/} The term 'move' designates any change in the employment status of the individual such as a transfer, layoff, recall, change of occupational classification, and any other similar movement. The term excludes leaves of absence for any reason and return to work after such a leave of absence. Any change in occupational classification had to be one of consequence in order to be counted as a move. Slight changes, of a purely formal character, such as a stenographer reclassified as a secretary, were disregarded. On the other hand, no distinction was made between involuntary and voluntary change in employment status. Promotion, or a locational transfer following an employee's request, was counted as a move.

Table 18

Primary 'Age-Service' Groups of Employees by Occupation

| | Group No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|--|---------------|---------------|---------------|---------------|---------------|-----------|-----------|---------------|-----------|-----------|-----------|---------------|----|-------|
| Born | Prior to 1921 | Prior to 1921 | Prior to 1921 | Prior to 1921 | 1921-1930 | 1921-1930 | 1921-1930 | 1921-1930 | 1931-1940 | 1931-1940 | 1931-1940 | 1941 or Later | | |
| Entered CNR Employ | Prior to 1945 | 1945-1950 | 1951-1956 | After 1956 | Prior to 1945 | 1945-1950 | 1950-1955 | 1956 or After | 1955 | 1955 | 1955 | After 1956 | | |
| Original Establishment and/or Occupation | | | | | | | | | | | | | | |
| Trainman..... | | 9 | 3 | | | | | | | | | | | 13 |
| Yardmaster..... | | 1 | 2 | | | | | | | | | | | 3 |
| Conductor and Trainman..... | | 11 | | | | | | | | | | | | 18 |
| Yard Foreman..... | | 5 | | | | | | | | | | | | 5 |
| Conductor..... | | 38 | 2 | | | | | | | | | | | 44 |
| Baggageman..... | | 2 | | | | | | | | | | | | 2 |
| Brakeman..... | | 19 | 3 | | | | | | | | | | | 33 |
| Yard Helper..... | | 1 | | | | | | | | | | | | 1 |
| Conductor and Brakeman..... | | 9 | 1 | | | | | | | | | | | 10 |
| Yardman..... | | 1 | | | | | | | | | | | | 1 |
| Freight Porter and Brakeman..... | | 1 | | | | | | | | | | | | 1 |
| Switch Tender..... | | 3 | | | | | | | | | | | | 3 |
| Assistant General Yardmaster..... | | 1 | | | | | | | | | | | | 1 |
| Relief Assistant General Yardmaster and Conductor..... | | 2 | | | | | | | | | | | | 2 |
| Fireman..... | | 22 | 4 | | | | | | | | | | | 31 |
| Engineer..... | | 27 | 1 | | | | | | | | | | | 28 |
| Total Yard Train Crews..... | | 152 | 16 | | | | | | | | | | | 196 |

(Cont'd)

Table 18 (Cont'd)

| Original Establishment and/or Occupation | Group No. | Prior to 1921 | | | 1921-1930 | | | 1931-1940 | | | 1941-1940 or Later | | | Total |
|--|-----------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|--------------------------|-----------|-----------|-------|
| | | Prior to 1921 | Prior to 1921 | Prior to 1921 | Prior to 1945 | Prior to 1945 | Prior to 1945 | Prior to 1950 | Prior to 1950 | Prior to 1950 | 1945-1955 | 1951-1955 | 1951-1955 | |
| Crew Dispatcher..... | | | | | | | | | | | | | | 5 |
| Machine Operator Clerk..... | 10 | | | | | | | | | | | | | 17 |
| Clerk Stenographer..... | 1 | | | | | | | | | | | | | 1 |
| Clerk..... | 10 | | | | | | | | | | | | | 14 |
| Car Checker..... | 7 | | | | | | | | | | | | | 19 |
| Call Boy, Car Checker..... | | | | | | | | | | | | | | 14 |
| General Yardmaster and Assistant..... | 4 | | | | | | | | | | | | | 4 |
| Total Yard Office..... | 32 | | | | | | | | | | | | | 74 |
| Clerk..... | 6 | | | | | | | | | | | | | 11 |
| Clerk Typist..... | 1 | | | | | | | | | | | | | 2 |
| Clerk Stenographer and Secretary..... | 1 | | | | | | | | | | | | | 13 |
| Professional Occupations Excluding Engineering..... | | | | | | | | | | | | | | 1 |
| Engineering..... | 1 | | | | | | | | | | | | | 5 |
| Business Car Steward..... | | | | | | | | | | | | | | 1 |
| Instrumentman and Rodman..... | 3 | | | | | | | | | | | | | 4 |
| Assistant Supervisor of Services..... | 1 | | | | | | | | | | | | | 1 |
| Total Superintendent. Staff, New Glasgow. | 12 | | | | | | | | | | | | | 38 |
| Carman, Carman Welder..... | 21 | | | | | | | | | | | | | 36 |
| Various Foreman and Leading Hands..... | 12 | | | | | | | | | | | | | 15 |
| Carman's Helper..... | | | | | | | | | | | | | | 15 |
| Car Cleaner..... | | | | | | | | | | | | | | 11 |

(Cont'd)

Table 18 (Concl'd)

| Original Establishment and/or Occupation | Group No. | Prior to 1921 | | Prior to 1921 | | 1921-1930 | | 1921-1930 | | 1931-1940 | | 1931-1940 | | 1941 or Later | |
|--|-----------|---------------|---------------|---------------|-----------|------------|---------------|-----------|-----------|------------|-----------|-----------|------------|---------------|-------|
| | | Prior to 1945 | Prior to 1950 | 1945-1950 | 1951-1956 | After 1956 | Prior to 1945 | 1945-1950 | 1950-1955 | After 1955 | 1945-1950 | 1951-1955 | After 1955 | 1956 | Total |
| Labourer..... | 1 | 1 | | | | | | | | | | | | | |
| Crane Operator..... | 2 | | | | | | 1 | | | 1 | | | | | |
| Clerk..... | | | | | | | 2 | | | | | | | | 2 |
| Carmen Apprentice..... | | | | | | | | | | | | | | | 3 |
| Electrical Worker..... | 1 | | | | | | | | | | | | | | 4 |
| Carpenter..... | 1 | | | | | | | | | | | | | | 2 |
| Firebuilder, Ashpitman, T.T. Man..... | 21 | | | | | | | | | | | | | | 1 |
| Pipefitter's Helper..... | 1 | | | | | | | | | | | | | | 7 |
| Boilemaker's Helper..... | 4 | | | | | | | | | | | | | | 1 |
| Machinist..... | 12 | | | | | | | | | | | | | | 5 |
| Boilemaker..... | 4 | | | | | | | | | | | | | | 15 |
| Machinist's Helper..... | 13 | | 1 | | | | | | | | | | | | 4 |
| Pipefitter..... | 4 | | 1 | | | | | | | | | | | | 15 |
| Fireman..... | | | | | | | | | | | | | | | 2 |
| Coal Pit Operator..... | 2 | | | | | | | | | | | | | | 5 |
| Call Boy..... | | | | | | | | | | | | | | | 2 |
| Electrical Worker's Apprentice..... | 1 | | | | | | | | | | | | | | 1 |
| Janitor..... | | | | | | | | | | | | | | | 1 |
| Machinist's Apprentice..... | | | | | | | | | | | | | | | 1 |
| Total Truro Car Shop and Roundhouse | 99 | 16 | 12 | | | | 13 | 12 | 6 | | 3 | 17 | 2 | | 180 |
| Grand Total..... | 295 | 32 | 13 | nil | nil | nil | 38 | 36 | 20 | 2 | 6 | 40 | 5 | 1 | 438 |
| Per Cent..... | 60.5 | 6.5 | 4.5 | 4.5 | 4.5 | 4.5 | 7.5 | 7.5 | 4.5 | 4.5 | 4.5 | 8.2 | 4.5 | 4.5 | |

* Less than 5 per cent.

Table 19

Moncton Yard and Engine Crews:
Career Patterns of Employees April 1960-September 1961

| | Total April 1960 | Deceased | Discharged or Resigned | Retired | On Other Assignment | Bumped Back as Fireman | On Same Assignment | Total November 1961 | Number of Layoffs in Period | Number of Leaves re Illness or Other Reason in Period |
|--------------|------------------|----------|------------------------|---------|---------------------|------------------------|--------------------|---------------------|-----------------------------|---|
| Fireman.... | 32 | 1 | | 1 | 11 | 2 | 17 | 29 | 5 | |
| Engineer.... | 27 | 1 | 2 | | 10 | | 14 | 24 | | |
| Other..... | 137 | 1 | 1 | 2 | 35 | | 98 | 108 | | 8 |
| Total..... | 196 | 3 | 3 | 3 | 56 | 2 | 129 | 161 | 5 | 8 |

Summary Table 20

'Age-Service' Groups by Number of Moves; All Four Establishments

| 'Age-Service' Groups | | Number of Moves | | | | | | | | | | | | |
|--|-----------|-----------------|----|----|----|----|----|---|---|---|---|-------|-----|-------|
| Age | Service | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-15 | 16+ | Total |
| 1. | -1921 | 29 | 63 | 20 | 9 | 2 | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 143 |
| 2. | -1921 | 4 | 2 | 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 18 |
| 3. | -1921 | 4 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 11 |
| 4. | -1921 | +1956..... | 9 | 11 | 6 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 33 |
| 5. | 1921-1930 | -1945..... | 2 | 4 | 1 | 1 | 1 | 3 | 2 | 1 | 3 | 1 | 1 | 19 |
| 6. | 1921-1930 | 1945-1950..... | 1 | 2 | 4 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 14 |
| 7. | 1921-1930 | 1951-1956..... | 1 | 2 | 4 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 3 |
| 8. | 1921-1930 | +1956..... | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 5 |
| 9. | 1931-1940 | 1945-1950..... | 1 | 1 | 1 | 1 | 1 | 5 | 2 | 1 | 2 | 1 | 1 | 40 |
| 10. | 1931-1940 | 1951-1955..... | 4 | 7 | 7 | 6 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 5 |
| 11. | 1931-1940 | +1956..... | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12. | 1941+ | +1956..... | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Total..... | | 50 | 95 | 47 | 21 | 14 | 16 | 6 | 9 | 7 | 6 | 14 | 7 | 292 |
| Broken Down by Establishment: | | | | | | | | | | | | | | |
| Truro Roundhouse..... | | | | | | | | | | | | | | |
| Truro Car Shop..... | | | | | | | | | | | | | | |
| Moncton Yard Office..... | | | | | | | | | | | | | | |
| New Glasgow Superintendent's Office..... | | | | | | | | | | | | | | |

Table 21

Technological Change Impact Areas, Atlantic Region, Occupational Groups by Number of Moves

| Occupations | Number of Moves | | | | | | | | | | Total | Man-Month Per Move | |
|---|-----------------|----|----|----|----|---|---|---|---|----|-------|-----------------------|-------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-15 | 16+ | |
| Boilermaker..... | 2 | 1 | | | | 1 | | | | | | 4 | 92 |
| Boilermaker's Helper..... | 3 | 1 | | | | 2 | 1 | 1 | | | | 5 | 240 |
| Machinist's Helper..... | 3 | 2 | 1 | | 1 | 1 | 2 | | | | | 15 | 434 |
| Machinist..... | 9 | 4 | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | | 16 | 697 |
| Ashpitman, Firebuilder, T.T. Man..... | 4 | 8 | 4 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | | 27 | 1,081 |
| Call Boy..... | 5 | 7 | 5 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | | 1 | 252 |
| Other Truro Roundhouse Employees..... | 11 | 11 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 2 | | 1 | 972 |
| Carman, Carman Welder..... | 3 | 3 | 2 | 2 | 2 | 3 | 1 | 3 | 2 | 3 | | 1 | 1,496 |
| Carman's Helper..... | 2 | 3 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 3 | | 15 | 815 |
| Car Cleaner..... | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 11 | 527 |
| Car Shop Lead Hand and Foreman..... | 1 | 3 | 1 | 1 | 2 | 3 | 1 | 1 | 1 | 1 | | 1 | 12 |
| Carman Apprentice..... | 7 | 4 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | | 1 | 314 |
| Other Truro Car Shop Employees, N.O.S..... | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | | 9 | 11.63 |
| New Glasgow Clerical Occupations, N.O.S..... | 4 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 7 | 197 |
| Clerk, Stenographer..... | 1 | 4 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 243 |
| Supervisory, Professional, Semi-Professional..... | 2 | 3 | 5 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | | 6 | 494 |
| Non-Clerical, New Glasgow Office..... | 8 | 4 | 6 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | | 14 | 445 |
| Call Boy, Car Checker..... | 7 | 6 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | | 12 | 9.47 |
| Car Checker..... | 5 | 8 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | | 11 | 489 |
| Yard Office Clerk..... | 2 | 5 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 16.00 |
| Yard Clerical Machine Operator..... | 7 | 6 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | | 14 | 236 |
| Other Moncton Yard Employees, N.O.S..... | 50 | 47 | 21 | 14 | 16 | 6 | 9 | 7 | 6 | 14 | 7 | 292 | 9,972 |
| Total..... | 50 | 95 | | | | | | | | | | | 10.23 |

It is of interest to note, first of all, just how much mobility there was in this relatively short period. Only 50 individuals out of the 292 made no move, and about half of the 292 workers moved twice or more (see Table 20). The effect of seniority rights can best be seen in Table 20. Seventy-five per cent, that is 38 out of 50, who made no move are to be found in service groups Nos. 1 and 5, which are the groups containing those employees who entered the service of the CNR before 1945. Likewise, about 78 per cent of those who made one move only can be found in these two age-service groups.^{6/} The effect of the establishment in which the employee worked is also evident in Table 20. Employees in the Moncton Yard made far fewer moves than, for example, the employees of the Truro Roundhouse, which is hardly surprising in view of the fact that activities in Truro began to be curtailed about two years earlier than at Moncton. In Table 21 the number of moves made by the individual is related to his occupation. There does not seem to be a strong relationship between occupations and the number of moves the individual made.

The last two columns in Table 21 are headed 'Total Man-Months' and 'Man-Months Per Move'. The use of this measure was necessary because, as was pointed out, the periods under review for the different establishments are not equal length. Moreover, as individuals died, retired, were discharged, or resigned, they were dropped from the sample and the further possibility of their moving was eliminated.^{7/}

The application of this device reveals some interesting variations. First, the range - according to occupation - is very large. It extends from 4.06 man-months per move for call boys to 31.40 man-months for car checkers. Of the other occupations, carmen apprentices, machinists' helpers, and yard office clerks show a very high frequency of moves, while clerks, yard clerical machine operators, and an occupational group consisting of supervisory, professional, and semi-professional workers show a low frequency of moves.^{8/}

Frequency of moves do not give us, by themselves, a complete picture of what has happened. Therefore, in Tables 22 and 23, moves are distributed according to type. The bottom of Table 22 provides the data on man-months of employment per move for each of the four establishments separately. This shows that employees of the Truro Roundhouse had the highest frequency of moves while employees of the Moncton Yard Office showed the lowest. The range is 9.48 man-months per move to 14.24 man-months per move.

6/ Groups 1 and 5 accounted for 176 of the 292 employees whose mobility was studied, or 60 per cent.

7/ To eliminate distortions arising from these facts, it was decided to develop a concept of 'man-months of employment'. In effect, the total months of employment were added up for each occupation, age group, and establishment. This was done to eliminate both the discrepancy arising out of the unequal analytical periods, and the fact that some people were employed by the CNR for less than the total period under review. This figure was then pro-rated over the number of moves made in the group of employees concerned. The resulting magnitude shows how many man-months of employment there were, on the average, between each move in that particular group. The magnitude of 'man-months of employment per move' bears an inverse relationship to the degree of mobility of the group.

8/ To some extent the effects of occupation and establishment are confounded in this study since particular occupations, as previously noted, tend to be peculiar to particular establishments.

Table 22

'Age-Service' Groups by Type of Moves; All Four Establishments

| Age-Service Groups | Retire- ment | Lay- off | Recall | Change of Occup. Local. | Change of Occup. Local. | Both Occup. and Locality | Resig- nation | Dis- charge | Deceased | Transferred Out of Region | Total | Man-Month Moves |
|--|-----------------|-------------|--------|----------------------------------|----------------------------------|-----------------------------------|------------------|----------------|----------|---------------------------------|-------|--------------------|
| | | | | | | | | | | | | |
| 1..... | 23 | 49 | 23 | 118 | 69 | 10 | 10 | 6 | 5 | 1 | 313 | 15.38 |
| 2..... | | 18 | 14 | 3 | 10 | 3 | 2 | 2 | | | 53 | 14.57 |
| 3..... | | 24 | 4 | 33 | 7 | 5 | 2 | 3 | | | 78 | 6.88 |
| 4..... | | | | | | | | | | | | |
| 5..... | | | | | | | | | | | | |
| 6..... | | | | | | | | | | | | |
| 7..... | | | | | | | | | | | | |
| 8..... | | | | | | | | | | | | |
| 9..... | | | | | | | | | | | | |
| 10..... | | | | | | | | | | | | |
| 11..... | | | | | | | | | | | | |
| 12..... | | | | | | | | | | | | |
| Total..... | | 183 | 95 | 329 | 184 | 64 | 29 | 13 | 7 | 2 | 929 | 11.12 |
| Broken Down by: | | | | | | | | | | | | |
| Truro Roundhouse..... | | 7 | 91 | 54 | 120 | 79 | 26 | 15 | 7 | 2 | 1 | 402 |
| Truro Car Shop..... | | 8 | 87 | 39 | 76 | 85 | 18 | 6 | 6 | 1 | 1 | 326 |
| Moncton Yard Office..... | | 7 | | | 69 | 1 | | 3 | | 1 | | 84 |
| New Glasgow Superintendent's Office..... | | 1 | 5 | 2 | 64 | 19 | 17 | 5 | 3 | 1 | 1 | 117 |
| | | | | | | | | | | | | 12.68 |

Table 23

Technological Change Establishments, Atlantic Region,
Occupational Groups by Type of Moves

| Occupations | Type of Moves | | | | | | | Transferred Out of Region | Total |
|---|-----------------|-------------|--------|---------------------------------|---------------------------------|--------------------------------|------------------|---------------------------------|-------|
| | Retire- ment | Lay- off | Recall | Change of Occup. Loca. | Change of Occup. Loca. | Both Occup. and Locality | Resig- nation | | |
| Boilermaker..... | 5 | 2 | 1 | 1 | 1 | 3 | 3 | | 12 |
| Boilermaker's Helper..... | 11 | 3 | 3 | 1 | 1 | 5 | 2 | | 17 |
| Machinist's Helper..... | 35 | 21 | 30 | 1 | 4 | 2 | | | 99 |
| Machinist..... | 1 | 5 | 23 | 15 | 5 | 3 | 2 | | 51 |
| Aspitman, Firbuilder, T.T. Man Call Boy..... | 10 | 9 | 25 | 31 | 14 | 2 | | | 85 |
| Other Truro Roundhouse Employees..... | 15 | 14 | 7 | 10 | 14 | 2 | | | 62 |
| Carman, Carman-Welder..... | 3 | 11 | 2 | 28 | 19 | 5 | 1 | 1 | 70 |
| Carman's Helper..... | 5 | 27 | 19 | 27 | 46 | 3 | 4 | | 131 |
| Car Cleaner..... | 32 | 13 | 21 | 7 | 8 | 3 | 3 | | 87 |
| Car Shop Lead Hand and Foreman..... | 23 | 9 | 9 | 7 | 1 | 1 | | 1 | 41 |
| Carman Apprentice..... | 2 | 1 | 12 | 9 | 2 | 2 | | | 27 |
| Other Truro Car Shop Employees N.O.S. | 2 | 13 | 10 | 2 | | | | | 29 |
| New Glasgow Clerical Occupations N.O.S. | 1 | 1 | 3 | 5 | 5 | | | | 14 |
| Clerk, Stenographer..... | 1 | 26 | 7 | 6 | 4 | | | 1 | 46 |
| Supervisory-Professional-Semi-Professional New Glasgow Office - Non-Clerical Occupations..... | 3 | 37 | 3 | 3 | 2 | 1 | 1 | 1 | 47 |
| Call Boy, Car Checker..... | 2 | 2 | 12 | 1 | 1 | 1 | 1 | | 22 |
| Yard Office Clerk..... | 5 | 25 | 1 | 2 | 1 | 1 | | | 3 |
| Yard Clerical Machine Operator..... | 1 | 4 | 20 | 1 | | | | | 29 |
| Car Checker..... | 1 | 14 | 8 | | | | | | 10 |
| Other Moncton Yard Employees N.O.S. | 23 | 183 | 95 | 329 | 184 | 64 | 29 | 1 | 23 |
| Total..... | | | | | | 13 | 7 | 2 | 929 |

Before discussing these three Tables, it should be pointed out that where an employee was recalled after a layoff into a significantly different occupational classification or into a different locality, the move was classified as a change in occupation, a change in locality, or as a change in both locality and occupation. The headings on the two Tables are self-explanatory. It is immediately evident from Table 22 that age and length of service have a decisive effect only for age-service group No. 1. All 23 retirements and 5 out of the 7 deaths may be found in this group. It is somewhat surprising to find 10 out of the 29 resignations, as well as 6 out of the 13 discharges, in this particular older age and long seniority group. Apart from these characteristics, this group appears to have made other types of moves with approximately the same frequency as those workers in the younger age and shorter service groups. A look at the establishment shows that the Moncton Yard Office has had no record of layoffs and that the New Glasgow Superintendent's Office has had relatively few. This is not surprising in view of the fact that white-collar employees are involved.

The data in Table 23 show clearly that occupation was a far more important determinant of the types of moves made by individuals than were age and length of service. While layoffs in the clerical impact areas were negligible, as might be expected, they were rather frequent in the non-clerical areas. It is interesting to see that 19 out of 29 resignations occurred among the non-clerical occupations as alternative job opportunities outside the railway were undoubtedly more plentiful in the white-collar field than for non-clerical occupations. A further interesting feature of this Table is to be found in the large number of moves involving a change of locality. Out of a total of 929 moves, 248 involved a change of locality or change of both occupation and locality. However, only two of the moves were transfers to a different region in the CNR system. These two facts, taken together, suggest that prospects of intra-area, as against inter-area, geographic mobility, are vastly different for the average employee.

Tables 24 and 25 analyze the individual adjustment process by comparing the terminal situation of the employee (as of September 1, 1961) with his employment status at the start of the analytical period. Here, the various moves made to arrive at the terminal situation have been disregarded. The headings in this Table make it clear that some degree of subjective judgment had to be exercised in deciding whether the terminal job was at the same, at a higher, or at a lower level relative to the job the employee had held at the beginning of the period. The factors taken into account in making this decision were the relative skill levels of the two jobs, the working conditions involved, and, if it could be assessed, the increased or decreased responsibility involved in the second job as compared to the first.

Again, the impact of age and length of service is quite evident from Table 24. Fifty-five employees out of 79 (or 70 per cent, which is 10 percentage points more than what one would expect) who retained the same level of job in the same location, may be found in age groups 1 and 5. All 23 retirements and 5 out of the 7 deaths occurred in group No. 1. However, it may also be seen that 16 out of 33 who resigned or were discharged were to be found in these two age groups, as well as 38 out of 62 who held the same level of job at a different location. Furthermore, 14 out of 25 people on layoffs at the terminal date are to be found in age-service groups 1, 2, 5, and 6, all four of which are relatively long-service groups. This points again to the fact that, although the influence of age and length of service cannot be ignored, it cannot be accepted as decisive. Obviously, the particular establishment exerted some influence on what happened to the employees.

Table 24

'Age-Service' Groups by Terminal Situation of Employees Relative to Starting Situation;
All Four Establishments

| Age-Service Groups | Same Level Job; Same Location | Higher Level Job; Same Location | Lower Level Job; Same Location | On Lay-off | Retired | Deceased | Same Level Job; Other Location | Higher Level Job; Other Location | Lower Level Job; Other Location | Transferred Out of Region | Resigned or Discharged | Total |
|--|-------------------------------|---------------------------------|--------------------------------|------------|---------|----------|--------------------------------|----------------------------------|---------------------------------|---------------------------|------------------------|-------|
| 1 | 42 | 10 | 7 | 8 | 23 | 5 | 30 | 2 | 3 | 1 | 13 | 143 |
| 2 | 5 | 1 | | 2 | 7 | | 4 | 1 | | 2 | 2 | 16 |
| 3 | | | | | | | 3 | 1 | | | | 13 |
| 4 | | | | | | | 8 | 2 | | | | Nil |
| 5 | | | | | | | 4 | 1 | | | | 33 |
| 6 | | | | | | | 6 | 1 | | | | 19 |
| 7 | | | | | | | 1 | | | | | 14 |
| 8 | | | | | | | | | | | | 4 |
| 9 | | | | | | | | | | | | 5 |
| 10 | | | | | | | | | | | | 40 |
| 11 | | | | | | | | | | | | 5 |
| 12 | | | | | | | | | | | | 1 |
| Total Broken by Impacted Areas..... | 79 | 28 | 11 | 25 | 23 | 7 | 62 | 16 | 6 | 2 | 33 | 292 |
| Total Truro Roundhouse..... | 19 | 4 | 4 | 10 | 7 | 2 | 26 | 4 | 2 | 1 | 17 | 96 |
| Total Truro Car Shop..... | 19 | 4 | 2 | 14 | 8 | 1 | 22 | 4 | 3 | | 7 | 84 |
| Total Moncton Yard Office..... | 35 | 20 | 5 | 7 | 1 | | 2 | 1 | | | 3 | 74 |
| Total New Glasgow Superintendent's Office..... | 6 | | | 1 | 1 | 3 | 14 | 6 | | 1 | 6 | 38 |

Table 25

Technological Change Establishments, Atlantic Region,
Occupational Groups by Terminal Situation Relative to Starting Situation

| Occupation | Same Level Job; Same Location | Higher Level Job; Same Location | Lower Level Job; Same Location | On Job; Same Location off | Same Level Job; Other Location | Higher Level Job; Other Location | Higher Level Job; Other Location | Lower Level Job; Other Location | Retired | Deceased | Transferred Out of Region | Resigned or Discharged | Total | | | | |
|--|-------------------------------|---------------------------------|--------------------------------|---------------------------|--------------------------------|----------------------------------|----------------------------------|---------------------------------|---------|----------|---------------------------|------------------------|-------|--|--|--|--|
| | | | | | | | | | | | | | | | | | |
| Boilermaker | | | | | | | | | | | | | | | | | |
| Boilermaker's Helper | | | | | | | | | | | | | | | | | |
| Machinist | | | | | | | | | | | | | | | | | |
| Machinist's Helper | | | | | | | | | | | | | | | | | |
| Ashpitman, Firebuilder, T.T. Man | 9 | 4 | | | | | | | | | | | | | | | |
| Call Boy | 4 | | | | | | | | | | | | | | | | |
| Other Truro Roundhouse Employees | 6 | 4 | | | | | | | | | | | | | | | |
| Carman, Carman-Weider | 15 | 4 | | | | | | | | | | | | | | | |
| Carman's Helper | | | | | | | | | | | | | | | | | |
| Car Cleaner | 2 | | | | | | | | | | | | | | | | |
| Car Shop Lead Hand and Foreman | | | | | | | | | | | | | | | | | |
| Carman Apprentice | | | | | | | | | | | | | | | | | |
| Other Truro Car Shop Employees | 1 | | | | | | | | | | | | | | | | |
| N.O.S. | | | | | | | | | | | | | | | | | |
| New Glasgow Clerical Occupations | 1 | | | | | | | | | | | | | | | | |
| N.O.S. | | | | | | | | | | | | | | | | | |
| Clerk, Stenographer | 2 | 3 | | | | | | | | | | | | | | | |
| Supervisory-Professional-Semi-Professional | | | | | | | | | | | | | | | | | |
| New Glasgow Office, Non-Clerical | 1 | | | | | | | | | | | | | | | | |
| Call Boy, Car Checker | 4 | 7 | 1 | | | | | | | | | | | | | | |
| Car Checker | 11 | 5 | 1 | | | | | | | | | | | | | | |
| Yard Office Clerk | 8 | | | | | | | | | | | | | | | | |
| Yard Clerical Machine Operator | 9 | 4 | 2 | | | | | | | | | | | | | | |
| Other Moncton Yard Employees | 4 | 3 | 1 | | | | | | | | | | | | | | |
| N.O.S. | | | | | | | | | | | | | | | | | |
| Total | 79 | 28 | 11 | 25 | 62 | 16 | 6 | 23 | 7 | 2 | 33 | 9 | 292 | | | | |

Twenty-four of the 25 individuals on layoffs as well as 24 out of the 33 who resigned or were discharged may be found in the non-office area (see Table 24). Thirty-five of the 79 who retained the same level job at the same location may be found among the employees of the Moncton Yard Office. As each establishment embraces occupations of somewhat similar character, one may suspect that occupation, rather than particular establishment, is the really important determinant. Table 25 seems to confirm this suspicion. Boilermakers and boilermakers' helpers, two occupations heavily affected by technological change, are practically all on layoff or have resigned or been discharged. Most ashpitmen, firebuilders, and men in similar less skilled, less specific occupations, could, for the most part, adjust themselves to the change provided they were willing to change location. Other employees whose occupations are in demand, such as clerks, stenographers, machine operators, supervisory personnel, and semi-professional people, were usually reallocated relatively easily, often at the same location.

Retirements shown in Table 25 are occasionally the result of early retirements due to an inability of the individuals to adjust themselves, a characteristic which may express itself in an unwillingness to relocate or a refusal to acquire new skills. Full-term regular retirement and early retirement have not been distinguished from each other in this Table. It is interesting to note that very few individuals ended up in a job rated lower than his job at the beginning of the period. Out of the 292 employees, only 11 were found at a lower level job in the same location, and 6 were in a lower level job at a different location. The contrast between high intra-regional geographic mobility and very low inter-regional mobility shows up once more in the terminal situations. At the end of the period of analysis, 84 of the 292 individuals had moved from their original locations to new locations.

The first conclusion to be drawn from these Tables is that lack of mobility, either occupationally or geographically within the region, was not a seriously inhibiting factor in the adjustment process of the individual. It seems clear that people were reconciled to the need for mobility and were generally willing to change occupational classifications. The second conclusion is that the prime determinant in what happens to the individual is his occupation and the demand for his services inside and outside the railroad industry. How this final adjustment is achieved also appears to depend, for the most part, on the individual's occupation. In this respect the seniority status of the employee is of great importance.^{2/} Seniority appears to be of somewhat less importance in influencing the type of final adjustment that is achieved. The third variable is the functional area in which the individual worked before the change. This influences both the final adjustment and the way the individual reaches it. For the most part this may be due to institutional factors (office, non-office employment), but it may work through other factors as well. For instance, car checkers in the Moncton Yard have been relatively little affected by the transfer of yard operations from the flat yards to the humpyard because car classification is an

^{2/} 'Status' here means breadth of the seniority territory and the man's position in his group. For an outline of seniority provisions, see Appendix to this chapter.

important part of both yard operations. On the other hand, employees of the Truro Roundhouse, regardless of their occupations, have been severely affected^{10/} by dieselization.^{11/}

CNR Training Programs

In the analysis so far only scattered references were made to various types of training provided by the company. At this point the role and extent of such training will be discussed in some detail.

It appears that four basically different types of training schemes are in existence. These are:

- 1) apprenticeship;
- 2) training for jobs specific to the industry, for which recruitment is difficult if not impossible;
- 3) training to update skills of various employees when this becomes necessary due to changes in technology; and
- 4) training in supervisory skills.

Within these schemes, the company regards with favour extra outside studies, but no refund of tuition fee or any other material help is extended as an incentive for such extra studies.^{12/}

The five-year apprenticeship plan entails 9,720 hours of instruction, and the size of the program is controlled by the number of craftsmen scheduled to retire five years later. Entrance requirements include Grade VIII education as well as favourable results on an aptitude test. The applicants must be between the ages of 16 and 21. An 'internship plan' is also linked to the basic apprenticeship scheme. Those who have successfully completed two years of training may enter a university. These individuals do not receive any money while studying but maintain their seniority, and their wage level is hypothetically raised at the proper dates. The fields of study at the university are restricted to engineering subjects.

Another plan by which workers may attend night classes is operated by the Interdepartmental Education Association - an independent organization organized and run by company employees. While these are employee-sponsored and organized courses the railway provides the facilities, helps get instructors and participates in presenting certificates to those completing the course or courses.

^{10/} This should be qualified by the fact that, in comparison to the Truro employees, car checkers would be covered by CB of RT seniority agreements which provided broader boundaries and larger seniority groups.

^{11/} It is difficult to hypothesize now as to whether the Truro men could have been re-employed. But the fact remains that, even if they had twenty years seniority and regardless of occupation, an employee with any seniority at another location or in another skill at the same location had prior claim to employment under the 'point craft' seniority provisions.

^{12/} This situation has changed since the time of the study. In accordance with company policy 50 per cent of the tuition fee is now refunded on completion of approved, job-oriented courses. The reception and use of this policy have been gratifying.

Training of manpower for specific jobs includes a number of different schemes. The courses for training diesel maintainers, air brake specialists, and air-conditioner experts are typical of these. They normally last 10 to 14 weeks, and the time is evenly divided between theoretical instruction and on-the-job demonstrations. The trainee takes this type of course on his own time and, after successful completion, does not necessarily obtain a raise in pay or job title right away.

Further instances of this type of training are the training schemes for work equipment operators in the 'Ways and Structures' division. These attempt to teach the operation and routine maintenance of work equipment during the winter to younger mechanics by means of a one-hour per week course of ten weeks' duration.

In the transportation division the main training field is rules instruction. According to Board of Transport Commissioners' regulations employees whose duties are associated with the operating rules must pass prescribed examinations at intervals not exceeding three years. Each employee receives a book which he studies until he feels he knows enough to pass an examination. Periodic instruction classes are conducted for those who have passed a satisfactory examination. Whenever centralized traffic control installations occur, special classes are held to familiarize employees with it, after which they have to pass another examination. From time to time there are training programs for telegraphers which last from six to twelve months. Normally, the person is placed with an agent who teaches him all phases of station work and, when the trainee is ready, sends him to Head Office to be examined. More specifically, he receives training in bookkeeping, passenger tickets, freight sales and billing, the handling of telegrams and other facets.

There is a 10- to 14-day course in operations of data processing machinery in yards.

There is a signal instruction car to provide facilities for training in signalling and signal maintenance. This type of training is mostly very practical with little formal instruction being given.

It should perhaps be mentioned that, in line with usual industry practice, the railway arranges, from time to time, for either factory representatives to visit the railway or for employees to visit the factory in order to familiarize personnel with new equipment.

Training to update skills may be given either in response to changing technology or as a condition for promotion. When it is given for the latter reason the course often includes the teaching of supervisory skills. The courses for section foremen and work equipment supervisors are directed exclusively towards keeping up with changing technology.

The section foreman course covers 30 subjects, all related to track maintenance. Students do not necessarily take all subjects. Section foremen who are younger than 55 years of age receive a two-week course. Prior to his entry into the course, an interviewer determines which subjects out of the 30 the person should take. Usually there are 10 people in the course at any one time. The work equipment supervisors receive a two-week course in Toronto. Sometimes they are sent away to factories to train for two or three days under supervisors who conduct courses in operating particular types of equipment.

The training scheme for roadmasters and assistant roadmasters may be regarded as one in which potential promotion plays a significant

role. The course consists of one lecture per week for 22 weeks, and includes subjects such as work study, budgeting, office procedures, weed-spraying, welding techniques, labour agreements, and rules instruction (that is, how to teach them).

There are also informal courses in safety and first aid. Line people are contacted every two or three years for short courses on these subjects on company time. Regional supervisors administer these courses. Attendance is not compulsory.

A good deal of training in supervisory skills is provided by means of a 32-hour course. Its basic purpose is two-fold: firstly, to improve the quality of middle management at present and for the future; secondly, to improve the teaching abilities of supervisory personnel.

No exposition of training in the industry would be complete without a brief summary of training in the communications department. This department pioneered several training schemes and, even now, seems to have the most advanced and extensive ones.

In this department training is carried out in company schools on company time. Technician training in microwave lasts about six months, and is open to scheduled employees who pass two tests (referred to as the barrier examination): a manual dexterity test, and an aptitude test. To pass these, one would need, roughly, a few years' experience and knowledge equivalent to that of a journeyman. As of January 1, 1961, electronics theory is one of the main courses taught. The other two types of technician courses are: testing and regulating (lasting about 16 weeks); and equipment maintainers, teletype, which is a 14-week course. For these two courses, applications are normally received from people in the communications department. There is very seldom any enrolment of outside manpower in these courses. Another training course in this department is for automatic operators. This is an eight-week course if the man has been with the CN communications department before, and a 12-week course if he comes from the outside. These last three occupations are at the skilled tradesman level. Other training schemes include those for: linemen, lasting four weeks; telephone operators, on-the-job training; perforator operators, one-week course; and radio operators, one week with the manufacturer followed by practical training on the job. The same sort of course is planned for linemen in the new humpyard. The total duration of this course will be approximately three weeks and will consist of both on-the-job training and theoretical training with the manufacturer. Station agents are receiving on-the-job training.

For courses designed to update skills, instructors can use their discretion in giving either on-the-job or classroom instruction. The supervisory course is very much like those in other departments and, in fact, it was pioneered in the communications department where it has been in effect since 1946. Additional types of training are: typing instruction to clerks; and encouragement of home study by the technical people (such as installers and helpers, cable splicers and helpers, etc.). The two main subjects that are encouraged are electrical theory and mathematics, and instructional materials are available from the Canadian Institute of Science and Technology. The communications department is the only department of the CNR where tuition fees are refunded after the successful completion of a course. Entrance requirements into the clerical jobs in the communications department are Grade XI or XII, or business college.

CNR Employment Office^{13/}

In conclusion, it may be of interest to review briefly the operations of the CNR regional employment office. These conceivably may have affected the adjustment processes studied previously.

The employment office operations of the Canadian National Railways are at present of great importance in attempting to minimize the impact of technological changes on the work force. Since 1958, all man-power requirements are supposed to have been reported to this staff department. In fact, this may not have been carried out fully, but the tendency has been increasingly to comply with this rule. Transfers, as well as the hiring of new personnel, were also to be channelled through the same department. These procedures were not in operation before 1958 and, therefore, while the services of the employment offices were available, many departments of the railway were obliged to hire employees directly. Thus the data presented in Table 26 refer only to the three years, 1958, 1959 and 1960, because information about previous years is not directly comparable to the post-1957 period.

First, it is interesting to note that the number of placements, including transfers, as a proportion of the number of applicants, does not differ greatly as between 1958 and 1960. This also holds true if a comparison is made between the number of applicants screened and the total number of placements. In 1959 total placements, expressed as a per cent of applicants and as a per cent of applicants screened, were higher than in either 1958 or 1960.

These remarks have to be modified somewhat due to the fact that total placements include a variable proportion of transfers from establishments affected by technological change. Transfers as a proportion of total placements seem to have declined quite significantly throughout this period. In the clerical group, they accounted for 33 per cent in 1958, 20 per cent in 1959, and only 15 per cent in 1960. In the non-clerical group transfers accounted for 75 per cent in 1958, 31 per cent in 1959, and 26 per cent in 1960. Another feature of this Table is that transfers, as a percentage of total placements, are consistently higher for the non-clerical group than for the clerical group. This, of course, does not mean that mobility was higher for the non-clerical group, a fact that becomes evident when the 'transfers canvassed' number is compared with the 'transfers accepted' number. In 1959, approximately one out of three transfers offered was accepted by the clerical groups, whereas only one in five, also an approximate proportion, was accepted by the non-clerical group. Similarly, in 1960, while approximately one out of two transfers offered was taken up by the clerical group, only approximately one in five was accepted by the non-clerical group.

This fairly intensive activity on the part of employment offices may, to some extent, account for the differences found among the employees with respect to intra-regional and inter-regional mobility. As different employment offices are responsible for different geographical areas, an extremely efficient co-operation of various employment offices

^{13/} Although this report does suggest some lack of co-ordination between employment offices in different regions, it should be noted that very strong channels of inter-regional communication have existed for some time subsequent to the period when employment offices were administered by Headquarters. For example, Atlantic (Maritimes) Region brakemen have transferred for part of the year to the Great Lakes Region.

Table 26

Employment Office Activities
CNR Maritime Area, 1958-1960

| | 1958 | | | 1959 | | | 1960 | | |
|--|----------|--------------|--------|----------|--------------|--------|----------|--------------|--------|
| | Clerical | Non-Clerical | Total | Clerical | Non-Clerical | Total | Clerical | Non-Clerical | Total |
| Number of Applicants..... | 3,502 | 8,971 | 12,473 | 5,350 | 11,489 | 16,839 | 3,579 | 12,703 | 16,282 |
| Applicants Screened..... | 258 | 853 | 1,111 | 417 | 1,181 | 1,598 | 348 | 937 | 1,285 |
| New Employees Engaged..... | 119 | 131 | 250 | 198 | 605 | 803 | 181 | 471 | 652 |
| Transfers Canvassed..... | N.A. | N.A. | N.A. | 93 | 1,068 | 1,161 | 46 | 765 | 811 |
| Transfers Accepted..... | 42 | 375 | 417 | 32 | 218 | 250 | 22 | 163 | 185 |
| Transfer Direct (includes rehabilitation cases)..... | 16 | 22 | 38 | 21 | 48 | 69 | 11 | 2 | 13 |
| Total Placements Including Transfers..... | 177 | 528 | 705 | 261 | 871 | 1,132 | 214 | 636 | 850 |

throughout the system would be essential to promote inter-regional mobility as effectively as is accomplished within each region by the single employment office. While it is not certain that the large differences in mobility are due to the different intensity of effort on intra- and inter-regional levels, this factor may well be a contributing difficulty to successfully accomplish transfers on an intra-regional basis. The examination of the four establishments, in all of which major retrenchments took place, would appear to indicate that, up to the end of the study period, intra-regional mobility has provided enough opportunities to prevent serious dislocation.

APPENDIX TO CHAPTER 6

An Outline of Seniority Provisions

Canadian Brotherhood of Railway Transport and General Workers

Seniority for employees represented by this organization was departmentalized with, generally speaking, two basic groups on each division, i.e., clerical and non-clerical. There were additional groupings, however, varying as follows:

Operation Department

In addition to the basic clerical and non-clerical groups, wharf and grain elevator employees in Halifax had separate seniority lists.

Motive Power and Car Equipment

In this department, clerical forces were divided into two groups: the staffs of the General Superintendent and Superintendent of Shops (including Moncton Shop) in one group, and all other clerical forces in another group. Seniority groupings for all other employees were as follows:

- a) one list for Moncton
- b) rest of the region; one list on each division for Motive Power employees and one list on each division for Car Equipment employees.

Stores Department

In the Stores Department there was no distinction between clerical and non-clerical forces, but three general seniority lists:

- 1) the staff in the general stores at Moncton including stationery stores but excluding the office staff of the General Storekeeper which is non-schedule
- 2) the scrap reclamation and rail yard employees except clerks
- 3) all other employees.

Sleeping, Dining and Parlour*

The following seniority groups did not include road service employees:

- 1) clerical staff under Superintendent, Halifax
- 2) all other employees under Superintendent, Halifax.

Traffic Department

This department has two separate groupings:

- 1) office staff of Passenger Traffic Department, Moncton, except as in (*) above
- 2) office staff of General Mail and Baggage Agent, Moncton.

In addition, there was one seniority list for each of the following departments:

- Purchasing Department
- Freight Claims Department, Moncton
- Office of Staff Recorder, Moncton
- Mail room employees, Elevatormen, General Office Building and Janitor, Medical Clinic and Atlantic Building, Moncton, as one group.

Shop Crafts (Division No. 4, Railway Employees' Department, AFL-CIO)

Seniority, with respect to employees working in shops, is based on 'point and craft'. This means that each craft at each location has a separate seniority roster. Similarly, helpers in each particular craft at each location have a separate seniority list. There is no interchangeability of seniority rights between craftsmen and helpers, crafts or locations. However, when an employee is transferred with his work to another location he takes his seniority rights with him.

At the Moncton Shops there are nine crafts and eighteen seniority groups. Similarly at other locations in the Maritimes there are two seniority groups for each craft at each location.

Order of Railroad Telegraphers

For those employees who are represented by the Order of Railroad Telegraphers seniority is based on 'Promotion Districts'. In the Maritimes there are four such districts, three of which are determined by provincial boundaries with a separate district for the Campbellton Division in New Brunswick. On each district there are four separate seniority groups:

- 1) Train Dispatchers and Controllers
- 2) Traffic Supervisors
- 3) Train Movement Directors and Assistants
- 4) Agents and Operators.

An employee starting in group 4 will establish rights in higher groups as he is promoted while retaining all rights in lower groups. Thus a train dispatcher, for instance, may have seniority rights in all four groups. An employee whose position is abolished or who is displaced may 'bump' a junior employee in his seniority group on his district or the junior employee in any other group in which he holds seniority on the division. He may also choose to protect spare work on his division but once he has elected to 'protect spare work' he must accept the work which is offered.

Maintenance of Way

There are two seniority groupings per division for maintenance of way employees; one seniority group consists of bridge and building forces and the other of track forces.

However, in addition to these two general groupings, there are six other groups of a more specialized nature. Thus, steel bridge workers,

equipment employees, masonry repair gangs and diving gangs have a separate seniority grouping on a regional basis. Employees in welding gangs may hold seniority on two or three divisions and cooks and cookees are divided into six divisional groups with an additional group in regional track maintenance.

Those employees who originally belonged to the two general groupings retain their seniority upon transfer to specialized groups; but if an employee is hired for a special group he establishes seniority in this specific group only.

Operating Employees

Brotherhood of Railroad Trainmen

Railway employees generally referred to as trainmen are divided into two seniority groupings: conductors as one group and all other employees, i.e., yardmasters, brakemen, etc., in a second group. There are ten promotion seniority districts for each group for a total of twenty groupings.

Brotherhood of Locomotive Engineers and Brotherhood of Locomotive Firemen and Engineers

There are six seniority districts for engineers and six seniority territories for firemen. When a fireman is promoted to the position of engineer he establishes seniority rights as an engineer but also retains his seniority rights as a fireman.

APPENDIX I

Technological Change and Grievance Bargaining

Within the scope of the project, an experiment was carried out to determine whether some insight could be gained into the impact of technological change on labour relations. The pioneering studies in this problem area, which were defined as the reaction of labour unions - as institutional entities - to technological change, attempt to survey the problem on a qualitative basis.^{1/} These articles seek to indicate those areas of collective bargaining which gain or lose importance in the eyes of unions when rapid technological changes take place. While many useful generalizations may be formulated in such terms, lack of quantitative data reduces their precision!

The approach used in this study still involves considerable elements of subjective judgment and is based on the fact that any changes in labour-management relationships must be accomplished either through the periodic collective bargaining sessions or through grievance procedures. It was hoped that, by examination of changes in collective agreements and grievances over time, the nature and timing of union reactions to technological changes introduced during the period would emerge.

In the railroad industry, collective agreements are changed continuously, and many details of a local nature are often set down in the form of a 'memorandum of agreement'. These practices make an examination of the timing and content of changes in agreements extremely difficult if not impossible.

With regard to the number and content of grievances, it must be recognized that many other factors affect them in addition to technological change. It appears to be recognized by both management and labour that personal factors play a prominent role as determinants. While there are no doubt limitations to the conclusions that may be drawn from this type of analysis, the opposite view, that is, that technological change has no effect on the number and substance of grievances, is untenable. The usefulness of a quantitative analysis of grievances hinges on whether it provides any additional insights into the problem rather than on the completeness of the analytical results.

Since the study was to be exploratory, it was decided that all grievances settled below the 'superintendent's' level would be disregarded. This seemed logical because any grievance which concerns itself with the principle of some importance to the union is carried up to at least the superintendent's level if a settlement favourable to the union is not achieved at a lower level.^{2/} On the other hand, many grievances concerning local conditions - which are individual problems settled at local levels of communication - were excluded. This greatly simplified the analysis.

^{1/} Impact of Automation: A Collection of Twenty Articles about Technological Change from the Monthly Labour Review, Bulletin 1287, United States Department of Labor, Part II, page 47.

^{2/} It must be recognized, however, that a number of unions are involved and that they exhibit different practices in their treatment of grievances. We therefore cannot argue that all disputes reaching the superintendent's level are necessarily of major importance.

Another restriction of the study was to confine it to a single division within the Maritime area or to some other similar small administrative unit. This restriction of scope was necessary because of the sheer bulk of the information which had to be analyzed. This opens up some critical questions about the representativeness of the administrative area chosen in relation to the entire system or economy.

To substantiate, in part, the analytical conclusions of the inquiry, an administrative area similar to the one under detailed review was also examined. It was found that this second area showed no significant variations from the one examined in detail. Since the second area had to be examined fairly superficially, it cannot be said with certainty that the two areas are identical in their responses to technological change. It can, however, be stated that no significant differences were found.

First of all, an examination of the timing of the major changes in technology in the Maritime area was carried out. This was then compared with the timing of the more significant contract changes during the period. Because of the complex characteristics peculiar to railway agreements, this analysis did not yield results of great importance. Railway agreements typically consist of incorporating into the final agreement various 'memos of understanding' and amendments to the agreement that have been reached during the life of the contract, but these memos and amendments are not always spelled out in specific terms.

Many of these 'memos of agreement' and local work rules do not exist in writing and, for practical purposes, cannot be traced. Yet changes in technology do seem to have repercussions in the agreements. When, for example, three yard offices were mechanized in August 1959, job reclassifications, with all the attendant work rules and jurisdictional limits, were renegotiated. Following the lengthening of sections and the introduction of different techniques in track maintenance, the union negotiated a training course for section foremen in July 1959. With the impending reorganization - which will eventually result in an integrated transportation system - a 'memorandum of understanding' was reached in February 1961 between the CNR and the Canadian Brotherhood of Railway, Transport and General Workers concerning changes in seniority rules,^{3/} certain pay rates, and occupational classifications. The parties also agreed to continue negotiations on other points which may occur in the process of consolidating a number of separate collective agreements.

Apart, however, from these instances, the attempt to trace changes in labour relations via an examination of changes in collective agreements in the railroad industry proved rather unsuccessful.

However, our attempt to analyze the grievances of the operating employees in one division (plus the employees engaged in the maintenance of motive power and car equipment) proved more feasible. It was found (see Table 27) that during the decade 1950 to 1960 there were 621 individual grievances lodged with the company which were not settled below the superintendent's level ('superintendent' meaning either the divisional superintendent or the superintendent of motive power and car equipment). Their timing over the decade appears to have a cyclical pattern as shown in Table 27. However, it is to be noted that, at the

^{3/} The agreement with CB of RT and GW, for instance, has resulted in a reduction of seniority groupings for employees represented by this organization from 44 to 6.

low points of the cyclical pattern, the grievances almost doubled from 26 in 1950 to 43 in 1955, while, at the peaks, there was an insignificant increase only, from 74 in 1953 to 78 in 1958. At least two factors besides personalities and technological changes have a strong influence on the number of grievances in any one time period. These are the general level of economic activity and the timing of the periodic contract negotiations.

The period under review is too short to reach any definite conclusions as to the relative importance of these factors, but it seems that depressed conditions in the entire economy tend to lower the number of grievances. On the other hand, there seems to be a tendency for the number of grievances to rise just prior to negotiation of a new contract. The first point may be substantiated by the 26 grievances in 1950, the lower number of grievances in 1954 and 1955 relative to 1953, and the relatively low numbers of grievances in 1959 and 1960. The second point holds true for the whole period, with the notable exception of 1954 to 1955 and 1958 to 1959 where, instead of increases in the number of grievances, decreases occurred. However, in both of these instances, the economy was emerging from a recession, and this additional factor may have altered the pattern.

Looking now at the grievance patterns for individual unions, it is interesting to see that in many cases there is a definite 'bunching' of grievances around various points in time. Such is the case with the engineers and firemen from the end of 1956 to the last part of 1959, no doubt reflecting the prominence of the diesel-firemen issue which was eventually settled in April 1958. Another occurrence among the Order of Railroad Telegraphers' grievances in 1959 and early 1960, seems to be a symptom of the integration of transportation services which will probably affect the ORT membership and the union itself adversely.

It is interesting to compare the time distribution of grievances lodged by the carmen with those of the electrical workers. While the electrical workers launched a relatively large number of grievances in the period 1952 to 1954, the carmen seem to have a concentration of grievances in the period 1958 to 1960. The latter situation reflects the concern of the carmen with the reduced traffic volume and the use of improved materials in motive power and car equipment, both of which have brought about a fairly serious reduction in job opportunities. The electrical workers, on the other hand, seem to have gained their place among the maintenance crafts by the end of 1954. This process is reflected in the 'bunching' of grievances in the period 1952 to 1954. After this date their position may be assumed to have become relatively secure. The machinists, whose work opportunities have diminished with dieselization, and the boilermakers, who have encountered a similar situation to a greater degree, seem to have fought, at one time, to preserve their jobs, after which there was a major decline in the number of grievances lodged. For the machinists, this period was from 1952 to the end of 1957, and for the boilermakers, from 1951 to June 1954. The sheet-metal workers seem to have periodic bursts of grievance activity rather than one single period of concentration, and these have occurred in 1954 and again in 1960.

The trend in number of grievances is, of course, merely a very crude indication of when occupations and crafts were affected by technological changes in the industry. Nonetheless, it would seem that at least some tentative indications with regard to the impact and timing of technological change may be demonstrated by the time-distribution of grievances. While the pattern may differ from one union to another, e.g.,

Table 27

Frequency Distribution of Grievances by One Division CNR and
Federated Trades Maritime Area, 1950-1960

| Year | Months | ORT | Maint. of Way Brother- hood | Engin- eers & Fire- men | Train- men | CBRT | Car- men | Elec- trical Workers | Sheet- Metal Wkrs. | Boiler- makers | Mach- inists | Other | Total |
|-------|--------------|-----|-----------------------------------|----------------------------------|---------------|------|-------------|----------------------------|--------------------------|-------------------|-----------------|-------|-------|
| 1950 | Jan.-June** | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 1 | 5 | 1 | 8 |
| " | July-Dec...* | | | | 2 | 5 | 2 | 13 | | 4 | | 1 | 18 |
| 1951 | Jan.-June** | 5 | | 1 | 1 | 6 | 5 | 2 | 1 | 4 | | 1 | 27 |
| " | July-Dec...* | 1 | | 1 | 1 | 11 | 9 | | 1 | 4 | | 1 | 22 |
| 1952 | Jan.-June** | 2 | 1 | 4 | 9 | 8 | 3 | | 2 | 6 | | 1 | 27 |
| " | July-Dec...* | 2 | 1 | 2 | 11 | 8 | 5 | | 2 | 5 | 5 | 2 | 35 |
| 1953 | Jan.-June** | 1 | 1 | 1 | 1 | 9 | 4 | 4 | 7 | 9 | | 2 | 37 |
| " | July-Dec...* | 3 | 2 | 1 | 3 | 8 | 5 | 2 | 3 | 2 | 6 | 6 | 37 |
| 1954 | Jan.-June** | 1 | 1 | 1 | 3 | 5 | 2 | 1 | 2 | 4 | 2 | 6 | 36 |
| " | July-Dec...* | 1 | 1 | 1 | 3 | 5 | 2 | 9 | 1 | 2 | 4 | 2 | 29 |
| 1955 | Jan.-June** | 1 | 1 | 1 | 8 | 4 | | 1 | 1 | 6 | | 1 | 22 |
| " | July-Dec...* | 2 | 2 | 2 | 3 | 2 | 4 | 1 | | 5 | 4 | 1 | 21 |
| 1956 | Jan.-June** | 3 | 1 | 6 | 6 | 15 | 4 | | 2 | 3 | 4 | 3 | 33 |
| " | July-Dec...* | | | | 2 | 3 | 7 | | 2 | 3 | 1 | 1 | 14 |
| 1957 | Jan.-June** | | | 4 | 3 | 8 | 6 | | 2 | 6 | | 3 | 27 |
| " | July-Dec...* | 1 | | 2 | 3 | 2 | 7 | | 3 | 6 | 6 | 3 | 24 |
| 1958 | Jan.-June** | 3 | | 3 | 3 | 6 | 15 | | 3 | 5 | 5 | 7 | 44 |
| " | July-Dec...* | | 1 | 3 | 6 | 11 | 12 | | 1 | 1 | 2 | 2 | 34 |
| 1959 | Jan.-June** | 2 | | 8 | 5 | 3 | 16 | | 2 | | 3 | 3 | 39 |
| " | July-Dec...* | 2 | 1 | 1 | 4 | 3 | 5 | | 3 | 1 | 8 | 1 | 27 |
| 1960 | Jan.-June** | 4 | | 3 | 1 | 4 | 6 | | 2 | 2 | 3 | 3 | 25 |
| " | July-Dec...* | | 6 | 1 | 8 | 12 | | | 2 | | 5 | 5 | 34 |
| Total | 1950-60..* | 32 | 13 | 39 | 69 | 135 | 156 | 31 | 11 | 20 | 72 | 43 | 621* |

* Total less than Table 28 because multiple grievances counted as one.

the difference in pattern between the sheet-metal workers and the boilermakers, the important differences show up where the trades are classified according to their changing employment opportunities in the industry.^{4/}

This presentation of numbers of grievances has been supplemented by a breakdown of their content (see Table 28). The total number of grievances analyzed in this Table is shown as 682, which is 61 more than shown in Table 27. The reason for this is that in the previous Table multiple grievances (e.g., three pay claims lodged at the same time) have been counted as one grievance, whereas in this Table, all are counted. The substance of each grievance has been classified into one of eight categories. These are as follows:

- 1) Grievance over pay claims, work rules, or other similar formal provision of the agreement.
- 2) The same as 1) above, except that the job security of the craft or the individual is involved. An example of this type of grievance is when a machinist puts in a claim for pay because his job was taken by some other craft which performed work previously reserved for machinists.
- 3) Grievance over contracting-out work; jurisdictional disputes. This type of grievance is related to a complaint about work being performed by outside contractors or work being performed by CNR employees other than the craft specified in the collective agreement.
- 4) Grievances over seniority rights is bumping, promotion, transfer, etc.
- 5) Grievances over unfair supervision, unsatisfactory working conditions, or unacceptable pay practices.
- 6) Grievances dealing with labour-management communications, e.g., no notice or late notice of layoffs, incorrect bulletins, and similar practices.
- 7) Disciplinary cases.
- 8) 'Suggestions and recommendations'. This is a category which contains employee complaints which have not been submitted as formal grievances. While not too frequent, they were numerous enough to be taken into account. It may be assumed that in most cases, had this form of protest not been available, a formal grievance would have been made on the basis of one or another of the contract provisions.

The left margin of Table 28 is ordered according to the union submitting the grievance and the period in which it did so. There are three periods which were set up for analytical purposes: 1) from 1950 to 1953 inclusive; 2) from 1954 to 1957 inclusive; and 3) from 1958 to 1960 inclusive.

^{4/} The electrical workers provide an example of tradesmen affected favourably; workers associated with the Canadian Brotherhood of Railway Transport and General Workers experienced, on the whole, roughly stable employment opportunities; while sheet-metal workers, boilermakers, machinists, and (most recently) the Order of Railroad Telegraphers have encountered declining opportunities.

It should be noted that over the period 1950 to 1960 Type No. III grievances (i.e., those concerning contracting-out and jurisdictional disputes) occurred most frequently. The next most frequent type of grievance was Type No. II (i.e., grievances concerning job security raised by some complaint about violation of a formal provision of the contract). Complaints about 'unfair supervision and inadequate working conditions' seem to have occurred relatively infrequently.

If these totals are broken down by the three different time periods, it is interesting to see the types of grievances which have diminished or increased in relative importance through the years. Type No. I, concerning 'pure pay or a rule complaint', has declined from 53 in period 1) to 37 in period 2), and to 33 in period 3), while 'unfair supervision or inadequate working conditions' have increased from 20 to 30 from periods 1) to 2) and to 41 in period 3). Types II and III, both explicitly dealing with job security, rose from 98 in period 1) to 111 in period 3). Complaints of Type IV (seniority provisions) have declined from 34 in period 1) to 28 in period 2) to 23 in period 3).

The eighth category (requests and suggestions) increased from 10 to 12 between periods 1) and 2) and then declined to 8 in period 3).

It would appear, therefore, that the emphasis has shifted to grievances of the types involving job security on the one hand, and to complaints about unfair supervision and inadequate working conditions, on the other. This most likely reflects in a large measure the impact of technological changes on morale, job satisfaction and the changing focus of union interest. One may say with some justification that the interests of the union appear to have shifted from the relatively short-term union and job security issues to the relatively long-term issues of employment maintenance and union survival.

If the grievances are broken down by originating unions as well as by the three analytical periods, some interesting observations can be made. In the case of the Order of Railroad Telegraphers, it will be noted that in periods No. 2) and No. 3) there were no grievances about contracting-out work or jurisdictional disputes, both of which affect job security, but disputes as to 'pay and rules involving job security' showed a small increase. In the case of engineers and firemen, it will be noted that pay and rule disputes involving job security, and the complaints about working conditions, have risen substantially, the former from eight in periods 1) and 2) combined to 16 in period 3), the latter from one in periods 1) and 2) combined to 20 in the third period.

It is of interest to note that the highest proportion of complaints originating with the electrical workers deal with the job security issues. Seventy-five per cent of such grievances fell into categories No. 2) and No. 3). This seemingly invalidates the hypothesis that declining job opportunities bring about an increase in this type of grievance. However, it must be remembered firstly, that the number of electrical workers has increased considerably over this period, and, secondly, that we do not distinguish in this breakdown between the 'aggressive' type and 'defensive' type of jurisdictional dispute; that is to say, those which complain about an encroachment on a particular craft area, and those which lay claim to areas which had hitherto belonged to another craft. No doubt the electrical workers have been involved in jurisdictional disputes in the course of extending the limits of their jurisdiction.

In the case of carmen and boilermakers, crafts for which job opportunities have lately been reduced, it is interesting to see that

in both cases the disputes about pay and rules have decreased, while those about job security have increased considerably. In the case of carmen, the increase in numbers is evidenced throughout all three periods, while in the case of boilermakers the increase occurs from period 1) to period 2). No grievances were lodged in the third period, because by that time there were relatively few boilermakers left in the employment of the CNR. The machinists presented an interesting pattern in that all types of grievances have decreased considerably from period 1) to period 3).

In conclusion it must be re-emphasized that this part of the study was experimental in character. More work is needed in different industries and different institutional frameworks before the effectiveness of the approach is fully evaluated and the limits of its usefulness determined. Two tentative conclusions are suggested by the data from this study: first, that the effects of technological changes show up fairly promptly in adversely affected occupations in the form of a higher frequency of grievances; and, secondly, that once the handwriting on the wall has been perceived the content of grievances involving adversely affected occupations tends to shift from short-term to long-term issues.

Table 28

Summary Sheet, Grievance by Operating People; Northumberland Division and Federated Trades
1950-1960 by Craft and Subject Matter of Grievance

| | | Type I | Type II | Type III | Type IV | Type V | Type VI | Type VII | Suggestions and Recommendations | Total |
|----------------------|--------|--------|---------|----------|---------|--------|---------|----------|---------------------------------|-------|
| O.R.T. | | 50-53 | 3 | 4 | 1 | 2 | 2 | | | 10 |
| " | | 54-57 | 5 | 1 | 3 | | | | | 11 |
| " | | 58-60 | 4 | 6 | | | | | | 11 |
| " | | 50-60 | 12 | 11 | 1 | 5 | 2 | 1 | | 32 |
| M of W | | 50-53 | 1 | 1 | 1 | 1 | 1 | 1 | | 5 |
| " | | 54-57 | | | | | | | | 10 |
| " | | 58-60 | 1 | | 8 | 2 | | | | 2 |
| " | | 50-60 | 2 | 1 | 1 | 10 | 2 | 1 | | 17 |
| Engineer and Fireman | Period | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 5 |
| " | | 2 | 2 | 7 | 1 | | | | 1 | 13 |
| " | | 3 | 6 | 16 | 5 | 20 | | | 3 | 50 |
| " | | 50-60 | 10 | 24 | 2 | 5 | 21 | 1 | 5 | 68 |
| Trainman | | 1 | 12 | 6 | 1 | 4 | 2 | | 9 | 25 |
| " | | 2 | 9 | 4 | 2 | 3 | 2 | 2 | 2 | 31 |
| " | | 3 | 5 | 7 | 3 | 2 | 2 | | 11 | 21 |
| " | | 50-60 | 26 | 17 | 6 | 9 | 6 | 2 | 2 | 77 |
| C.B.R.T. | | 1 | 7 | 20 | 3 | 8 | 2 | 8 | 2 | 55 |
| " | | 2 | 3 | 12 | 10 | 9 | 4 | 6 | 2 | 50 |
| " | | 3 | 6 | 6 | 11 | 4 | 12 | 4 | 2 | 46 |
| " | | 50-60 | 16 | 38 | 24 | 21 | 18 | 18 | 9 | 151 |

Table 28 (Cont'd)

| | | Type I | Type II | Type III | Type IV | Type V | Type VI | Type VII | Suggestions and Recommendations | Total |
|----------------|---|--------|---------|----------|---------|--------|---------|----------|---------------------------------|-------|
| Carmen | 1 | 16 | 8 | 12 | 11 | 5 | | | 3 | 55 |
| | 2 | 8 | 5 | 22 | 5 | 12 | 2 | 1 | | 53 |
| | 3 | 11 | 22 | 20 | 9 | 6 | 2 | 2 | | 72 |
| | | 35 | 35 | 54 | 25 | 23 | 3 | 3 | | 180 |
| Machinist | 1 | 6 | 6 | 14 | 7 | 4 | 1 | 1 | 1 | 39 |
| | 2 | 6 | 5 | 11 | 4 | 6 | 1 | | | 33 |
| | 3 | | 1 | 3 | 3 | 1 | | | | 8 |
| | | 12 | 12 | 28 | 14 | 11 | 2 | 1 | | 80 |
| Pipefitter | 1 | 1 | | 1 | 1 | | | 1 | 1 | 1 |
| | 2 | 1 | | | | | | | | 2 |
| | 3 | | | | | | | | | 3 |
| | | | | | | | | | | |
| Electrical W. | 1 | 2 | 4 | 9 | 1 | 2 | | 1 | | 18 |
| | 2 | 1 | | 3 | 1 | | | | | 6 |
| | 3 | | | 8 | | | | | | 8 |
| | | | | 20 | 2 | 2 | 1 | | | 32 |
| Sheet Metal W. | 1 | | | | 3 | 1 | | | | 5 |
| | 2 | 1 | | | | | | | | 6 |
| | 3 | | | | 6 | 1 | | | | 11 |
| | | | | | 9 | 1 | | | | |
| Boilermaker | 1 | 4 | 1 | | | | 2 | 1 | | 12 |
| | 2 | | 1 | | | | | | | 8 |
| | 3 | | | | 11 | 2 | | | | |
| | | | | | | | | | | 20 |

Table 28 (Concl'd)

| | | Type I | Type II | Type III | Type IV | Type V | Type VI | Type VII | Suggestions and Recommendations | Total |
|----------------------|-------|--------|---------|----------|---------|--------|---------|----------|---------------------------------|-------|
| Atlantic Fed. Trades | | 1 | | 1 | | 2 | 1 | | | |
| " | 2 | | | | | 3 | | | | 4 |
| " | 3 | | | | | 5 | | | | 3 |
| " | 50-60 | | | 1 | | | 1 | | | 7 |
| Blacksmith | | 1 | | | 1 | | | | | |
| " | 2 | | | | 2 | | 1 | | | 1 |
| " | 3 | | | | 2 | | 1 | | | 3 |
| " | 50-60 | | | | | | | | | 4 |
| Total for Period I | | 53 | 51 | 47 | 34 | 20 | 12 | 2 | 10 | 229 |
| Total for Period II | | 37 | 34 | 69 | 28 | 30 | 11 | 6 | 12 | 227 |
| Total for Period III | | 33 | 58 | 53 | 23 | 41 | 7 | 3 | 8 | 226 |
| GRAND TOTAL | | 123 | 143 | 169 | 85 | 91 | 30 | 11 | 30 | 682 |

APPENDIX II

The Reporting Divisions

Reporting Division 'General'

Seasonality of employment slowly but steadily decreased until 1951. Thereafter the seasonal influence on employment became more pronounced until 1956, when seasonal fluctuations in employment were roughly 20 per cent higher than in 1948. Since that date, the seasonality of employment has slowly decreased and in 1959 and 1960 the seasonality effect was of the same magnitude as in 1949. In that year, however, it was about 6 per cent greater than the all-time low which occurred in 1951.

Reporting Division 'Maintenance of Ways and Structures'

Seasonality of employment had declined from 1948 to 1952, the latter being a year during which the least change of seasonal employment pattern occurred in the twelve-year period under review. During 1953, the index of seasonality rose and it did so again in 1954 and 1955, after which it declined in 1956 and 1957. Subsequent to 1957, employment tended to become more seasonal each successive year including the last year, 1960, at which time it proved to be about 10 per cent less seasonal than in 1948 but about 18 per cent more seasonal than in the year of least seasonality, 1952.

Reporting Division 'Maintenance of Equipment'

By and large this time series displays a similar pattern to the previous two in the early part of the period under review. Seasonality of employment declined to an all-time low until 1952, after which it rose again reaching a high in 1956 and 1957, which was approximately double that of 1948 and 262 per cent of the all-time low in 1951. After 1957 the seasonality of employment declined steadily and sharply and, in 1960, proved to be somewhat lower than in 1948, when it was about 20 per cent higher than the all-time low in 1951 and only about 46 per cent of the high seasonality displayed in 1956 and 1957.

Reporting Division 'Transportation Non-Train'

A reduction of seasonality of employment is evident from 1948 to 1952, the latter being the year of lowest seasonality in the twelve-year period. During this year the index of seasonality was only approximately 47 per cent of that in 1948. From 1952 to 1959 the series displays increasing seasonality, rising to the highest degree of seasonality in 1959, which was roughly two and a half times as large as in 1952, the year that displayed the lowest degree of seasonality of employment. From 1959 to 1960 there was a very slight decline in the index of seasonality, a decline so slight that 1960 remained still the year with the second highest degree of seasonality of employment during the entire period.

Reporting Division 'Transportation Train'

Here, also, seasonality of employment similar to the reporting division discussed previously, has increased throughout most of the twelve-year period. From 1948 it declined till 1950, after which rising year after year reached a high degree of seasonality in 1960, that was approximately twice as high as in 1948. Seasonality in 1960 was about two and a half times as great as in the lowest year, 1950.

Total Employment Including 'Other Operations'

The pattern of changing seasonality of employment including 'Other Operations' follows the main trends displayed by the five other reporting divisions. Seasonality of employment declined from 1948 to

an all-time low in 1952, that was about 30 per cent below 1948. After 1953, a steady and gradual increase in seasonality of employment is evident; by 1959 to 1960 it was about 34 per cent higher than the all-time low in 1952, but somewhat lower than in 1948.

Total Employment Excluding 'Other Operations'

The degree of seasonality displayed by this time series decreases from 1948 to 1949, rises again in 1950, after which it declines till 1956, the year which displays the smallest degree of seasonality. Seasonality in 1956 appears to be about 26 per cent less than in 1948 or 1950. From 1957 on, the degree of seasonality increased and in 1960 was about 14 per cent higher than the 1956 low. Even though the degree of seasonality rose in the last few years, in 1960 it was still well below 1948, 1949 and 1950.

The large irregular factor in technical terms is accounted for by the fact that large variations exist from year to year in the intra-year employment patterns. It was found, for example, that with respect to each of the reporting divisions during the fourteen-year period under review (1947-60), there was no consistency as to the time of year when the highest and lowest points of employment occurred. In the reporting division 'General', the highest level of employment occurred twice in January, twice in February, once in March, eight times in August, and once in September, while the lowest level of employment was evident twice in January, once in February, once in March, seven times in November and three times in December.

In the reporting division, 'Maintenance of Ways and Structures', the highest levels of employment occurred once in January, four times in February, four times in March, twice in August, once in September, twice in October, and the lowest level of employment fell within January once, within March twice, within April eight times, within May once, and within December once.

In the 'Maintenance of Equipment' division, the highest levels of employment were found to exist four times in January, twice in February, twice in March, once in April, twice in June, twice in November and once in December. The lowest levels were evident twice in January, twice in July, twice in August, once in September, twice in October, twice in November and four times in December.

In the reporting division, 'Transportation Non-Train', the highest levels of employment were found twice in January, twice in February, three times in April, twice in August, once in September, once in November and three times in December, and the lowest levels were found four times in January, once in February, three times in May, twice in June, once in July, once in November and once in December.

The highest levels of employment in the 'Transportation Train' reporting division were found once in January, four times in February, four times in March, four times in April, and once in November, while the lowest levels of employment were twice in January, twice in May, four times in June, once in July, once in August, twice in November and twice in December.

No doubt this type of variability takes such intra-year variations out of the seasonal category and they must be classified as random or irregular variations. The only substantive explanation that can be advanced to account for it may be that various seasonal manpower requirements were postponed for various lengths of time due to other considerations and perhaps as a consequence of the relatively more irregular

investment pattern. Why investment patterns should be relatively more irregular have, of course, been discussed in general terms quite extensively, but no doubt in the railway industry, where the various large-scale technological changes have taken place in the last decade, long-range planning and short-term expediency may have rendered investment decisions even more irregular than their basic nature would dictate. It is a well-known fact, of course, that in the railroad industry several types of work are more easily postponable than the usual types of work in industry.

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